Universiteit Gent
Fakulteit van de Wetenschappen

Akademiejaar 1994-1995

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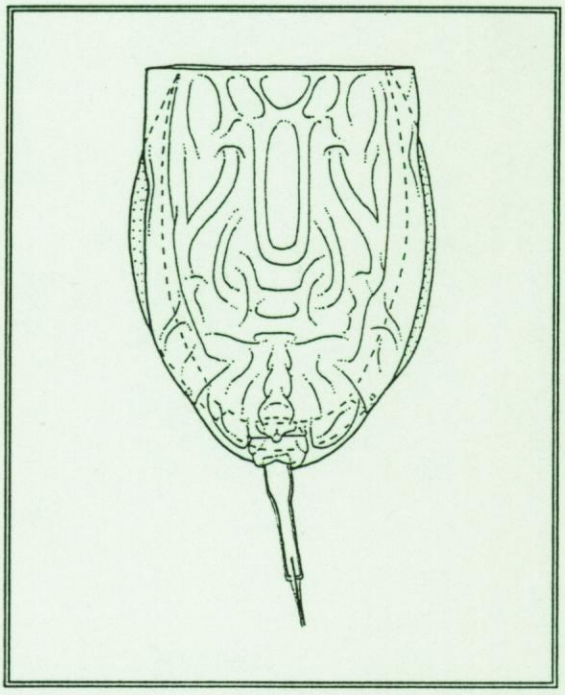
Part II: Morphology and Taxonomy of *Lecane*

by

Hendrik SEGERS



Proefschrift ingediend tot het
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Promotor
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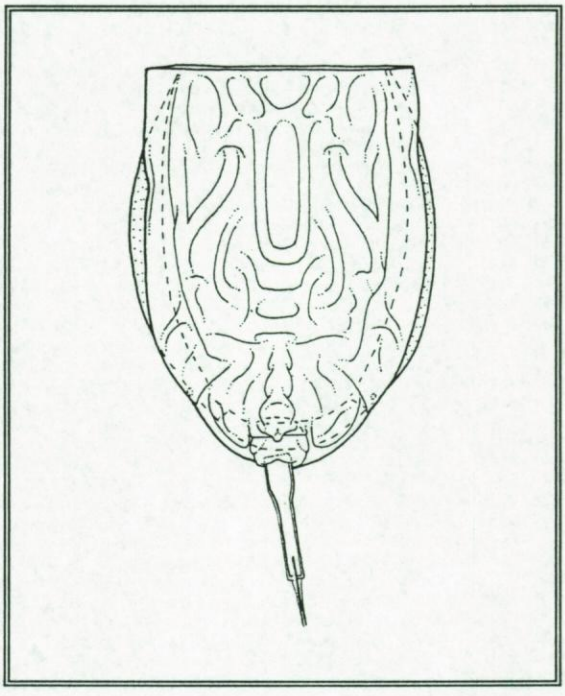

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VLIZ (vzw)
VLAAMS INSTITUUT VOOR DE ZEE
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Frontpage: an undescribed Bolivian Lecane

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Errata

p. 3 Abbreviations: add: Lo l.: lorica length
p. 64 Comments: - f. *pycina*: see figs (not figus) 152-153
p. 97 Note: ... *attributed* to Murray ...
p. 144 Comments: second paragraph second line: ... *attributed* to ...
p. 160 Comments: last line: ... equal *claws*.
p. 165 *Lecane scutata* Differential diagnosis first line: ... by *lacking* longitudinal
p. 178 Distribution: third line: 193*8*)
Comments: third line: *attributed* to Wulfert, 1966), ...
p. 215 Bērsiņš, B., 1959: ... Französ*i*sch ...
p. 222 Segers, H., N. Emir & J. Mertens: ... North an*d* Northeast ...

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INTRODUCTION

The Lecanidae constitute a group of common fresh and saline water Rotifera. All species are substratum-dwellers, that are able to swim freely over short distances only. They live mainly in littoral habitats, but also occur in the psammon and in exotic water bodies such as phytotelmata (see Pejler & Bērziņš, 1994). Lecanids are distributed all over the world, including the Arctic and Antarctic. The group reaches its highest diversity in the littoral of stagnant or slowly flowing waters in the tropics and subtropics, where assemblages containing up to 40 different species can be found. Most species are cosmopolitan, but a considerable number have restricted ranges. Some species (e.g. *Lecane closterocerca*, *L. hamata*, *L. lunaris*) are among the most common Rotifera, others have not been recorded since their description.

The family's single genus, *Lecane*, is one of the most species-rich of Rotifera. In the present work, 163 species are treated as valid. There is little doubt that more species will eventually be found: some of the insufficiently described taxa listed as *species inquirendae* may actually be valid, but need redescription. On the other hand, the existence of undescribed species is real, especially in tropical regions (e.g., figs 2-4 in Segers *et al.*, 1993a; fig. 1 in Segers & Sanoamuang, 1994). Specimens that do not 'fit' the key and diagnosis, may be considered potential new species. It is strongly recommended, however, not to base descriptions on single specimens.

The taxonomy of *Lecane* is considered to be rather difficult by most researchers. This is due mostly to the great diversity of the group, the high intraspecific variability in many species, and the confusion resulting from the ease with which specimens of *Lecane* get distorted through inadequate fixation, thus creating artifacts. A number of names, especially in the older literature, are accompanied by incomplete or superficial descriptions, and types or topotypical material are unavailable, further adding to the taxonomic confusion in the group. As a result, many records and, hence, general statements on distribution and ecology of species of *Lecane* should be interpreted with care. When compared with other groups of Rotifera, the highly specialised lorica of *Lecane* offers a relatively large number of morphologic characters, useful for consideration in taxonomic studies and identification. Trophi morphology, on the other hand, has so far only incidentally been applied (Segers, 1994). Although it offers additional information for taxonomic purposes, it appears to be impractical for use in routine identifications.

ACKNOWLEDGEMENTS

Several colleagues provided support and advice during the preparation of this work. I am especially indebted to M. De Ridder for valuable suggestions and discussions. R. Chengalath, H. Dumont, L. Forró, T. Nogrady, Y. Ranga-Reddy, L. Sanoamuang and S. S. S. Sarma are acknowledged for their critical comments on the manuscript.

Material was collected in various localities and countries, or supplied by many colleagues, including L. Baert, K. Desender and J. P. Maelfait (K.B.I.N.: Galàpagos islands), H. J. Dumont and J. Mertens (R.U.G.: Brazil, Brunei, China, Easter Island, Oman, Saudi Arabia, Turkey, Yemen), G. Lindau (Heidelberg, F.R.G.: Comoro Islands and Madagascar), S. Montenegro-Guillen (C.I.R.A., Nicaragua), C.S. Nwadiaro (Nigeria), L. Sanoamuang (Thailand, New Zealand), N. N. Smirnov, N. M. Korovchinsky (Russia). Students of the B.A.D.C. international training course 'The Zooplankton: a tool in Lake Management' supplied material of various tropical countries. G. Murugan assisted in the preparation of trophi for S.E.M. examination. W. Koste kindly supplied photographs and original drawings of several species, P. N. Turner provided immense help in tracing relevant citations. W. De Smet, J. De Manuel and C. K. Brain are thanked for providing specimens of *L. pumila*, *L. margalefi* and topotypical specimens of *Proales namibiensis*, respectively. N. N. Smirnov, N. M. Korovchinsky and G. Xiaoming are acknowledged for providing translations of Russian or Chinese texts.

I thank all the staff of the Laboratory of Animal Ecology, Zoogeography and Nature Conservation for their support and assistance.

MATERIAL AND METHODS

Type material of only few species could be examined. Types of species, described by Harring & Myers (1926) and reported to have been deposited in the National Museum of Natural History, appear not to be present in the collections of this Museum (Bright, *in litt.*), many of Myers' slides have deteriorated (Taylor, *in litt.*). Original figures are provided of all species actually seen. Of the valid species not seen figures and descriptions were, whenever possible, drawn from their original descriptions. Descriptions and short diagnoses of some probably valid, insufficiently known species are provided in notes.

Samples were collected in the field using a 50 µm mesh plankton net, and preserved immediately after sampling by adding formaldehyde up to a final concentration of 4%. Animals were picked under a Wild M10 dissection microscope, transferred to glycerine and examined under high magnification (1000x, oil immersion, Medilux 12 (Kyowa) microscope). All original figures were drawn with a camera lucida. Scale bars refer to these drawings only. Scanning electron microscopy (S.E.M.) was performed on complete animals, after dehydratation in alcohol and subsequent critical point drying. Trophi were isolated using NaOCl, repeatedly washed in distilled water and dried, all on a circular cover slide. After sputter-coating with gold, the preparations were examined with a JEOL JSM-840 microscope.

Abbreviations used are as follows:
DPl.: Dorsal plate length; DPw.: Dorsal plate width; VPl.: Ventral plate length; VPw.: Ventral plate width; tot. l.: total length; l.: length.

BM: The Brunei Museum, Brunei Darussalam
INPA: Instituto Nacional de Pesquisas da Amazôna, Manaus, Brazil
KBIN: Royal Belgian Institute for Natural Sciences, Brussels, Belgium
MNCNM: Museo Nacional de Ciencias Naturales, Madrid, Spain
MRAC: Royal Museum for Central Africa, Tervuren, Belgium
MZB: Museo de Zoologia, Barcelona, Spain
PANS: Philadelphia Academy of Natural Sciences, U.S.A.
RUG: University of Ghent, Belgium
SAM: South Australian Museum, Australia
SMF: Senckenberg Museum u. Forschungsinstitut, Frankfurt a. Main, Germany
SNMNH: Saudi Arabian National Museum of Natural History, Riyadh, Saudi Arabia
NMNH: National Museum of Natural History, Washington D.C., U.S.A.
ICZN: International Code of Zoological Nomenclature (International Commission of Zoological Nomenclature, 1985).

For type specimens deposited in NMNH, PANS or the North American Museum of Natural History, only the repository of those actually present in these institutes (Nogrady, *in litt.*) are mentioned.

All measurements are in µm. Toe length excludes claw length.

TAXONOMY AND NOMENCLATURE

Rotifera in general, and *Lecane* in particular, exhibit a remarkably wide range of intraspecific variability. Apart from the frequent occurrence of preservation artifacts, any character shows random variation, and varies following environmental conditions and genetic constitution. Additionally, discontinuous intrapopulation variation may result from the co-occurrence of different clones. The possible hybridisation of related species, as in Cladocera (Lieder, 1956; Brooks, 1957; see Pejler, 1956 and Nogrady *et al.*, 1993; e.g., *L. lamellata* - *L. thalera*?), should also be taken seriously. Some sources of morphological variation are dealt with by Pejler (1977) and Koste & Shiel (1987).

This wide and confusing, at times discontinuous intraspecific variability, together with restricted taxonomic knowledge has made rotifer taxonomy particularly difficult. Researchers either adhered to a typologic approach at a time when this had long been abandoned in other groups, or tried to apply complex taxonomic concepts ('superspecies', 'species groups', 'subspecies',...) to a group, in which the relations between taxa at circumspecific levels are only now becoming clear (see Snell, 1989; Koste & Shiel, 1989; Nogrady *et al.*, 1993). Not only the taxonomy, but also the correct application of the rules governing Zoological Nomenclature still continues to be problematic (e.g., misuse of trinary nomenclature, of the term '*nomen novum*',... see also Koste & Shiel, 1987).

In view of the confusion in contemporary rotifer taxonomy, it is advisable to adhere to the practical view on taxonomy formulated by Pejler (1977). In the framework of the present work, no case could be identified in which a deviation from the basic category in taxonomy, the species, is justified. Although 'the essential thing is not to name deviations, but to describe variation' (Pejler, 1977), ecologically relevant and/or common, easily recognisable infrasubspecific variants are identified in a few cases. They have no significance in a taxonomic sense, and are referred to by adding the following formula after the correct species name (Segers, 1992):

f. *name* Author, date

A complete reference to the variant with rounded posterior projection of *L. ludwigii*, would then be *Lecane ludwigii* (Eckstein, 1883) Harring, 1913a f. *ercodes* Harring, 1914.

FAMILY LECANIDAE BARTOŠ, 1959

Three genera or subgenera (*Lecane* Nitzsch, 1827; *Hemimonostyla* Bartoš, 1959 and *Monostyla* Ehrenberg, 1830) were distinguished until recently (Koste, 1978; Koste & Shiel, 1990), but only one, *Lecane*, is recognised here (Segers, 1993).

The only character reported to separate *Lecane*, *Hemimonostyla* and *Monostyla* is the degree of fusion of the toes: complete separation in *Lecane*, partial fusion in *Hemimonostyla* and total fusion in *Monostyla*. It is hypothesized that a complete separation of the toes represents the most plesiomorphic character state, and a complete fusion the most apomorphic character state (character polarity ascertained by a comparison with representatives of Proalidae, a sister group of Lecanidae). The validity of *Lecane* (s.s.), *Hemimonostyla* and *Monostyla* as separate supraspecific taxa is untenable because of the following arguments.

1) Under the above assumption on character polarity, the diagnosis for *Lecane* (s.s.) as well as *Hemimonostyla* is based on a single character in a plesiomorphic state, which is theoretically unacceptable;

2) Both *Hemimonostyla* and *Monostyla* are polyphyletic taxa, as can be seen when comparing species such as *L. pusilla* Harring and *L. undulata* Hauer with *L. clara* (Bryce) and *L. agilis* (Bryce) or *L. inopinata* Harring & Myers and *L. furcata* (Murray) with *L. blachei* Bērziņš, *L. nwadiaroi* Segers and *L. unguitata* (Fadeev). Obviously, *L. pusilla*, *L. undulata*, *L. inopinata* and *L. furcata*; *L. clara* and *L. agilis*; *L. blachei*, *L. nwadiaroi* and *L. unguitata* are more closely related to each other than to any of the other species listed, especially to those with which they would be united in *Hemimonostyla* and *Monostyla*;

3) Several species exhibit intraspecific variability that surpasses the limits of the (sub)generic diagnosis: see *L. nana* and its var. *monostyla* (also *L. aeganea*, *L. tenuiseta*), *L. furcata* as in fig. 333 or *L. bulla* as in fig. 358 (specimens with a distinct fissure anterior to the onset of the claws or pseudoclaws).

Genus *Lecane* Nitzsch, 1827

Type species: *Lecane luna* (O. F. Müller, 1776), designation by Harring (1913a).

Synonyms: *Monostyla* Ehrenberg, 1830
Distyla Eichwald, 1847
Distyla Eckstein, 1883 non Eichwald, 1847
Cathypna Hudson & Gosse, 1886
Diarthra Daday, 1897
Hemimonostyla Bartoš, 1959.

Literature: Harring (1913a), Harring & Myers (1926), Edmondson (1935), Wiszniewski (1954), Bartoš (1959), Koste (1978), Koste & Shiel (1990), Segers (1993).

Diagnosis

The genus *Lecane* is diagnosed by the structure of the foot and of the trophi in the female. Foot inserted subdistally, consisting of an anteriorly partly covered, rigid foot pseudosegment bearing two separate or partly fused toes, or a single toe. Trophi characterised by a short fan- or rod-shaped fulcrum; small but broad, asymmetrical rami bearing alulae; unci with mostly three unequal, fused teeth; manubria broad, elongate, and curved distally.

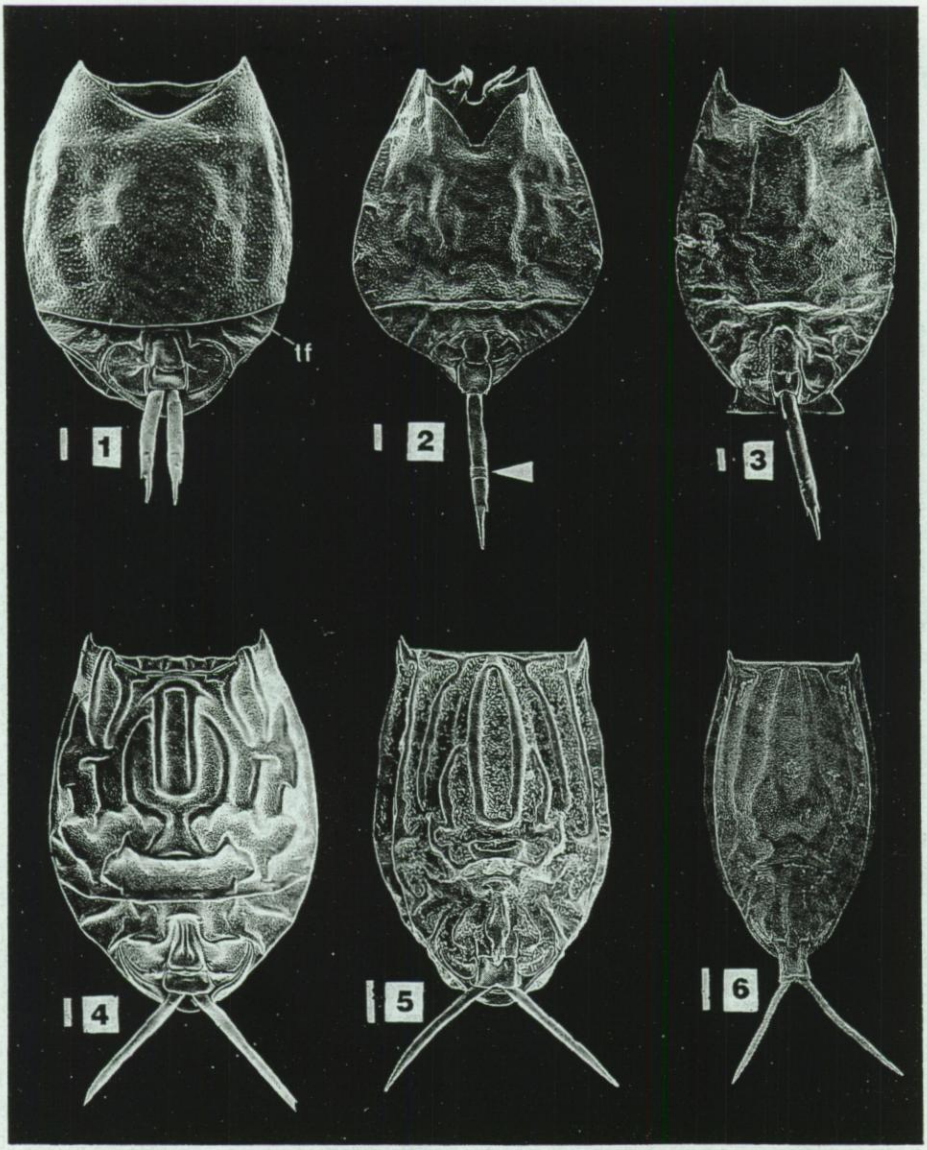
Morphology

Lecanids are small- to medium-sized rotifers. The body of females is cylindrical, dorso-ventrally flattened and consists of an anterior head region and a posterior loricate part, or is illoricate. The head can be retracted into the lorica through an anterior, slit-like head aperture. Some species bear a fringe of minute spicules on the head, which, in contracted animals, appears on the inner side of the head aperture (e.g. *L. palinacis*, *L. dumonti*, *L. bifurca*).

The lorica (figs 1-33) covers most of the body. It consists of a dorsal and a ventral plate, connected laterally and caudally by a relatively soft pleural membrane. The lorica is smooth (e.g., figs 1, 14) or ornamented with simple ridges (fig 18), folds (figs 8-13), hemispheres (fig. 7) or well-defined patterns of ridges (figs 4, 5, 19) and/or spicules. The presence or absence, and degree of ornamental folds on the lorica depend on contraction. The antero-lateral corners of the lorica are rounded, angulate or bear sharp (figs 1, 3-6, 9, 11, 13), barbed (*L. satyrus*) or recurved (*L. boettgeri*) spines. These are formed exclusively by the ventral plate (as in *L. luna*), by the ventral and dorsal plates (in *L. pertica*) or emerge between the dorsal and ventral plates (*L. mucronata*, *L. aculeata*). Rounded antero-sublateral projections may be present (*L. papuana*). The precise shape of the head aperture depends on the degree of contraction of the specimens (Wiszniewski, 1954; Donner, 1954; e.g., see figs 489-501).

The ventral plate (figs 1-13) is relatively flat. It is divided by a complete (figs 1-4) or incomplete (figs 5-13) transverse fold (fig. 1, fig. 8: 'tf') forming a large anterior and a smaller posterior part with the foot plate (see further). In species with an incomplete transverse fold, a pair of weak or strong longitudinal folds may be present (figs 5-13; fig. 8: 'lf'). The anterior margin of the ventral plate is slightly convex (fig. 7), straight (fig. 11), weakly (fig. 10) or strongly (fig. 9) concave, or otherwise differentiated. The lateral margins are straight or more (figs 2-4) or less (figs 5, 6) curved, parallel (fig. 11) or irregularly undulate (figs 8, 12), with or without anterior notch (fig. 8). The distal margin is rounded (fig. 1), truncate or differentiated into a projection, which may itself be rounded (fig. 23), fishtail-shaped (fig. 3, 17, 19), square, rectangular, spiniform or double spiniform (see *L. ludwigii*). In a single species (*L. spiniventris*), the ventral plate bears a pair of spines as extensions of the longitudinal folds.

The dorsal plate (figs 14-19) is domed, posteriorly rounded (figs 14-17) or truncate (fig. 19), and mostly smoothly rounded laterally. The dorsal head aperture margin is slightly convex (fig. 7), straight or nearly so (fig. 11) or more or less concave (figs 14, 17, 19). When contracted, the dorsal plate can fold in a way as to form a frontal convex projection (see *L. sibina*, *'L. ungulata australiensis'*). The lateral mar-



Figs 1-6. Lecane spp., ventral views (S.E.M. photographs). 1: *L. luna*; 2: *L. quadridentata*; 3: *L. lamellata*; 4: *L. curvicornis*; 5: *L. signifera*; 6: *L. pertica*.
Scale bars: 10 µm. tf: transverse fold.
(1, 2: Turkey (Segers *et al.*, 1992); 3: Saudi Arabia (Segers & Dumont, 1993b); 4, 5, 6: Maracá Island, Roraima, Brazil).

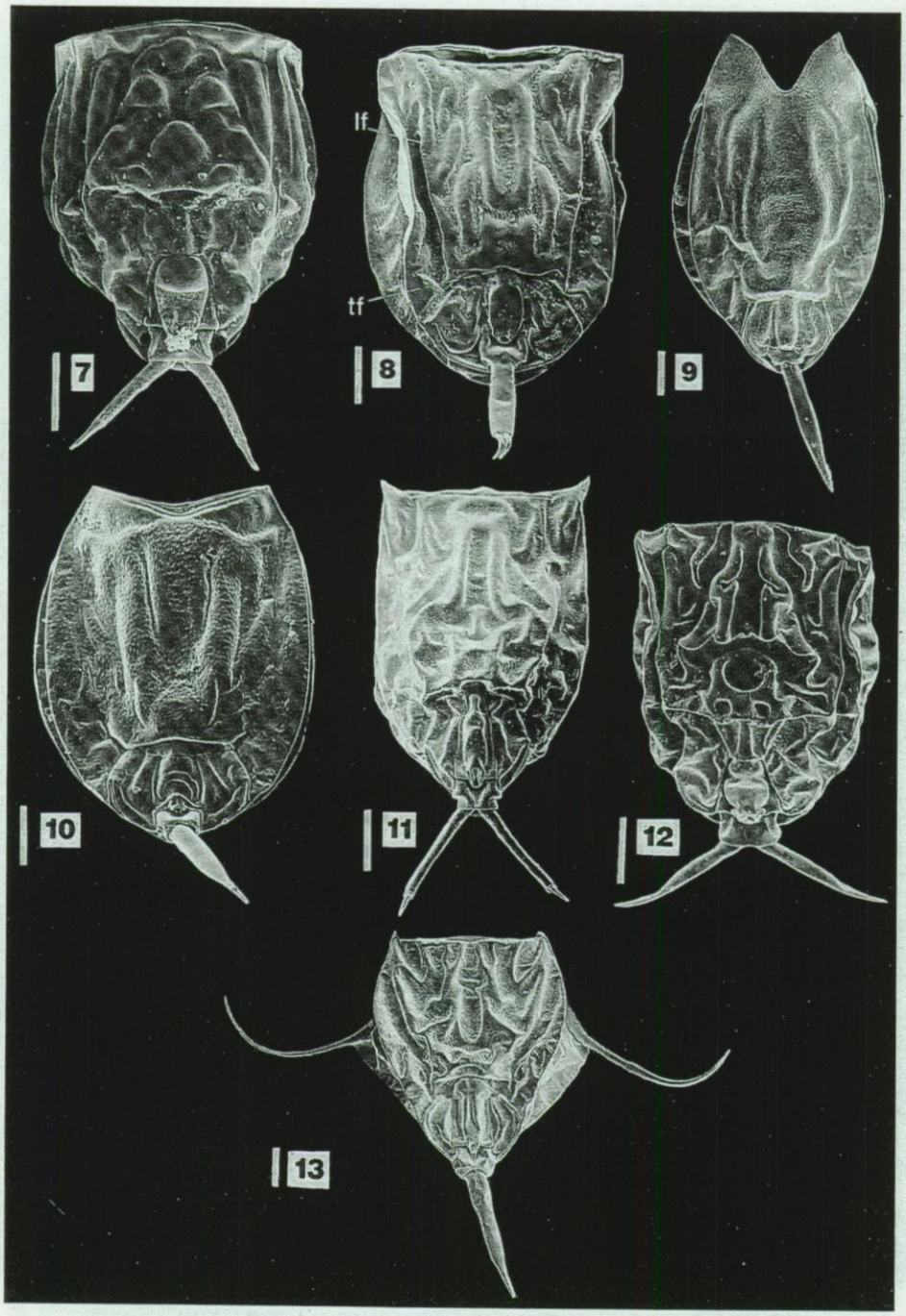
gins of the plate may (fig. 14, 15, 18, 19) or may not (fig. 9, 17) reach the head aperture. A pair of anterior (fig. 15) or lateral projections (fig. 13) may be present (*L. quadridentata* and *L. monostyla*, respectively).

The ventral plate is usually anteriorly wider, and medially narrower than the dorsal plate (figs 8, 10, 19). In some cases, the dorsal plate is consistently wider than the ventral (fig. 7), or the dorsal consistently narrower than, or, at most, as wide as the ventral (figs 14-17).

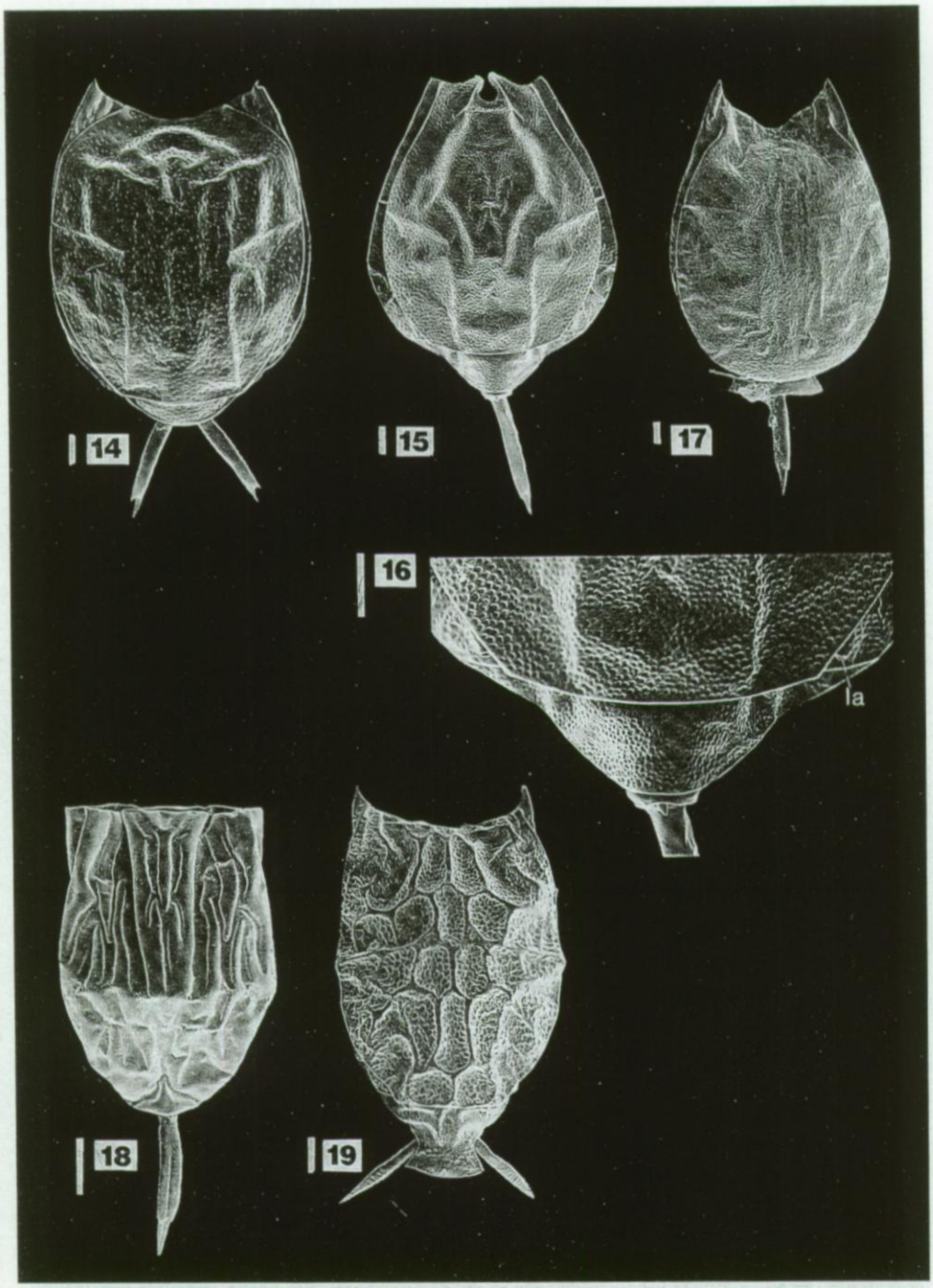
A pleural membrane connects the dorsal plate to the ventral, and is either invaginated forming deep or shallow lateral sulci, or not. It may extend dorsally of the head aperture in species having the lateral margins of their dorsal plate (*sensu stricto*) not reaching the head aperture (fig. 17). In a single species (*L. spiniventris*), subantero-lateral spines, lying in lateral sulci, are present. Apertures for the lateral antennae appear in the posterior region, in the ventralmost part of the membrane (fig. 16: 'la'). The part, projecting distally beyond the dorsal plate ('posterior segment' of most authors, e.g. Harring & Myers, 1926) can be smooth or bear ridges (fig. 19, see *L. subtilis*).

The posterior part of the ventral lorica is differentiated medially into a characteristically shaped foot plate (fig. 21, also figs 20, 22-30). This plate is bordered anteriorly by the above-mentioned transverse fold, and laterally by two extracoxal folds ('ef'). It bears a pair of rounded (fig. 8), rounded but triangular (e.g., fig. 23, 26) coxal plates ('cp') or spiniform coxal processes (*L. bifurca*), which project beyond the posterior edge of the ventral plate, or not. Anterior to the foot pseudosegment (= second foot segment of most authors; 'fp'), and partly covering it, is a prepedal fold ('pf'; = first foot segment), of which two types exist. The first type (figs 5-13, 20, 21, 23, 25, 29, 30) is narrow and elongate, and has a median projection distally; this projection bears a single pore (fig. 23) which is probably the opening of the pedal glands. The second type (figs 1-4, 22, 24, 26, 28) is relatively short but broad and has a smoothly rounded posterior margin. A pair of pores can be seen on the anterior attachment membrane of the foot pseudosegment, covered by the posterior margin of the prepedal fold (fig. 24). Thus, openings of the pedal glands remain separate. The projecting part of the foot pseudosegment has, in many cases, a characteristic shape (e.g., figs 20, 28-30). It may (figs 20, 22, 29, 30) extend beyond the posterior margin of the ventral plate or not (figs 21, 23-28). The complicated structure of the foot plate offers mobility to the foot pseudosegment (e.g., fig. 27).

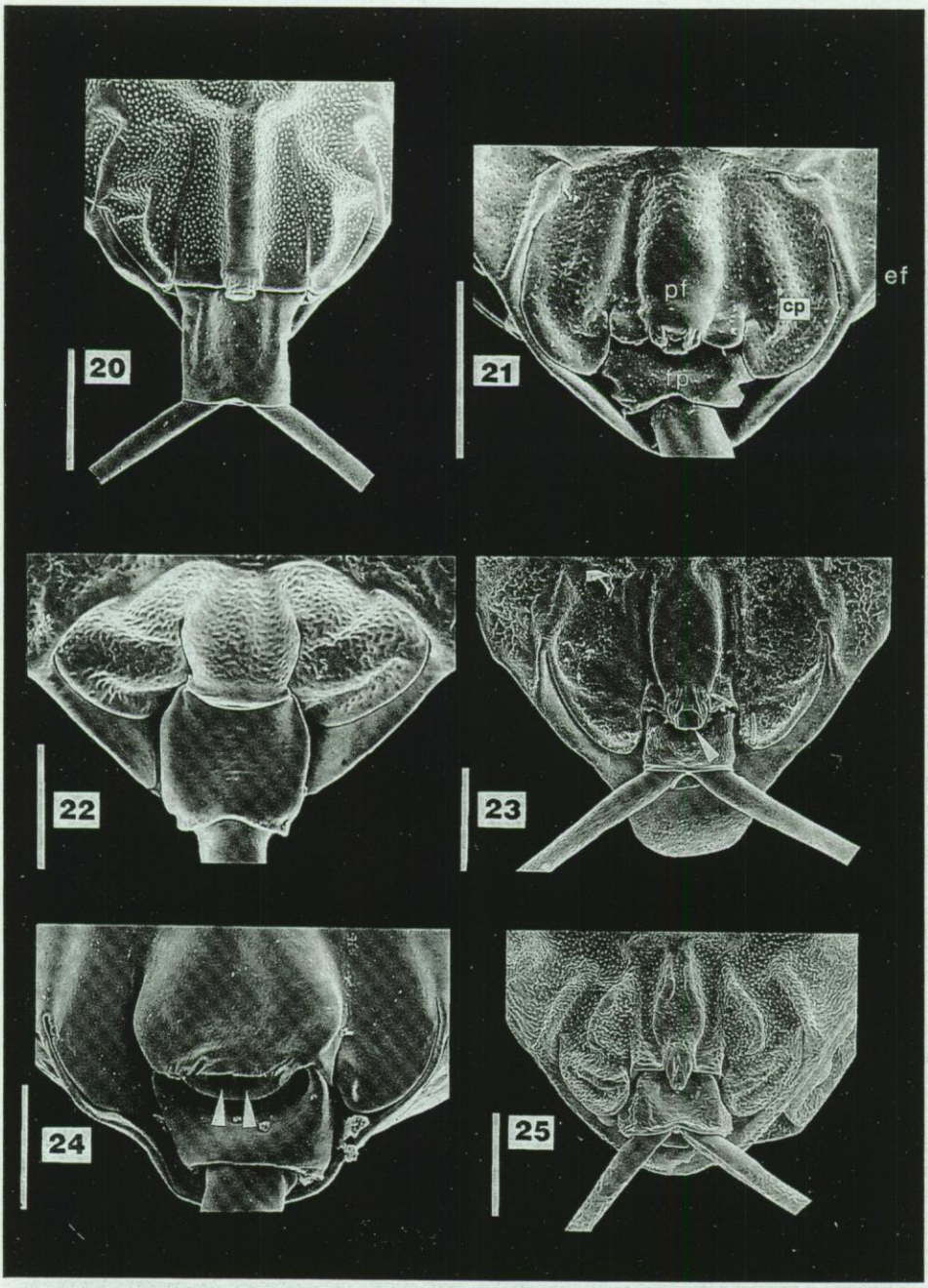
The foot pseudosegment bears two completely separated (fig. 1), partly (fig. 18) or totally (figs 2, 3) fused, movable toes. Transverse folds or local constrictions (e.g., as in fig. 2) are common artifacts. The toes may be parallel-sided, bulging or broadest basally or medially, or taper from midway onwards. The tip of the toes may be smooth, symmetrical or asymmetrical (*L. hornemanni*) or be armed with claws, of which two types exist. The first type is completely (figs 8, 11, 12, 29, occasionally inserted eccentrically: fig. 30), or incompletely (fig. 7) separated (so-called 'real claws': fig. 31, 'c'), the second type is only indicated by a unilateral notch (pseudoclaws: fig. 1, occasionally fused: fig. 32: 'pc'), both with (fig. 29, 31, 32: 'ac') or without accessory claws. Claws and pseudoclaws are mostly spiniform, but can be curved or have a thickened basis. *L. eutarsa* bears a fringe of minute finger-like accessory claws near the basis of the claw, a character so far unrecorded and unique to the species. Dorsal to the insertion of the toe(s) is a single small, semicircular (fig. 27) or roughly triangular pedal lobe, (fig. 33: 'pl'), a structure also present in the Proalidae.



Figs 7-13. Lecane spp., ventral views (S.E.M. photographs). 7: *L. ruttneri*; 8: *L. furcata*; 9: *L. decipiens*; 10: *L. closterocerca*; 11: *L. arcula*; 12: *L. doryssa*; 13: *L. monostyla*.
Scale bars: 10 µm. lf: longitudinal fold, tf: transverse fold.
(8, 10: Turkey (Segers *et al.*, 1992); 7, 9, 11-13: Maracá Island, Roraima, Brazil).



Figs 14-19. Lecane spp., dorsal views (S.E.M. photographs). 14: *L. luna*; 15, 16: *L. quadridentata*, 16: posterior region of lorica; 17: *L. lamellata*; 18: *L. braziliensis*; 19: *L. ludwigii* f. *ichthyoura*.
Scale bars: 10 µm. la: aperture of lateral antenna
(14-16: Turkey (Segers *et al.*, 1992); 17, 19: Saudi Arabia (Segers & Dumont, 1993b); 18: after Segers *et al.*, 1993b).



Figs 20-25. Lecane spp., foot plate (S.E.M. photographs). 20: *L. pertica*; 21: *L. decipiens*; 22: *L. quadridentata*; 23: *L. ludwigii* f. *ercodes*; 24: *L. bulla*; 25: *L. signifera*.
Scale bars: 10 µm. cp: coxal plate, ef: extracoxal fold, fp: foot pseudosegment; pf: prepedal fold.
(22: Turkey (Segers *et al.*, 1992); 20, 21, 23-25: Maracá Island, Roraima, Brazil).

Illoricate species have a body wall not differentiated into a ventral and dorsal plate. They, however, do have a foot plate (with or without coxal plates or spines), a foot pseudosegment and one or two toes.

Trophi structure (figs 34-39, 40-61) has not or rarely been used in taxonomic studies of *Lecane*, but may contribute to a better diagnosis of inadequately known taxa (see Segers, 1994). The fulcrum (fig. 35, 38: 'fu') is short, fan-shaped or rod-like, and is at times strongly reduced. A basal plate (fig. 38: 'bp') is present, especially in larger species. The rami (figs 35, 36, 38, 39, 'ra') are short and broad, weakly to strongly asymmetrical. Fenestrae to the cavities in the rami are visible in dorsal view (figs 36, 39, 'fe'). A basal apophysis is mostly present, as well as alulae. The rami have inwardly-curved distal parts. Complicated ligamentous connections between the two rami (dorsally: fig. 36) and between rami and unci (fig. 38) indicate that the mobility of these parts is limited. The unci (fig. 38: 'un') consist of three subequal, fused teeth. Subunci could not be observed. The manubria (e.g., fig. 34) are relatively long, and incurved distally. The proximal articulation pit is relatively wide, an exterior apophysis is present in some species (fig. 35: 'ea'). The mode of elongation of the manubria is remarkable. Apparently, it is not the shaft of the manubrium, but the normally short proximal part that is stretched. This can be seen in fig. 34, where the anterior and medial cavity ('ac', 'mc'), characteristic of the proximal part of the manubrium, extend along the straight part of the manubrium. Accessory trophi parts (figs 40-61; epipharyngeal plates, preuncinal teeth,...?: Segers, 1994) occur commonly. However, these get dissolved quickly while preparing trophi using sodium hypochlorite (NaOCl). Their practical use in taxonomic studies is hardly likely.

Males (figure 62) are known in a few species only (e.g., Harring & Myers, 1926: *L. quadridentata* (fig. 513); Wiszniewski, 1934a: *L. clara* (figs 508-509), *L. levistyla* (figs 510-511), *L. psammophila* (fig. 514); Wiszniewski, 1936: *L. perpusilla* (figs 515-516); Sudzuki, 1964; de Beauchamp, 1965: *L. luna* (fig. 512); Koste, 1983: *L. leontina*). They are invariably reduced and smaller than the corresponding females. They have an elongate vermiform body, and a terminal foot. Although the fusion of the toes in males appears to correspond to that in the females, a rigid foot pseudosegment as described above is not present, but the foot is pseudoannulated, as in *Proales*.

Resting eggs (figure 63; De Manuel, 1994; Donner, 1954; Koste, 1983) are, again, only known in a few species. They are not deposited, but remain in the lorica of the female which apparently dies after their production. Resting eggs are relatively large, and have a thick outer shell.

Key to the species

1. – Toes separate, mostly spread 2
   – Toes partly or completely fused, mostly held together 82

2. (1) – Body illoricate: dorsal or ventral plate not distinguishable 3
   – Lorica with dorsal and ventral plate, these may be soft. 12

3. (2) – Toes ending in acute point, no claws 4
   – Toes bearing claws or pseudoclaws 7

4. (3) – Toes short (15-20 μm) 5
   – Toes longer (24-40 μm) 6

5. (4) – Coxal plates acute, projecting (figs 64-65) **1. *L. calcaria***
   – Coxal plates inconspicuous (figs 66-67) **2. *L. niothis***

6. (4) – Toes parallel-sided, with distinctly separated tip (figs 68-69) **3. *L. rhacois***
   – Toes widest medially, tapering to acute point distally (figs 70-73) **4. *L. clara***
   (see also *L. inquieta* (fig. 74), *L. tenua* (fig. 75)

7. (3) – Projecting coxal spines present (figs 76-78) **5. *L. palinacis***
   – No coxal spines 8

8. (7) – Toes extremely short (12-15 μm: figs 79-82) **6. *L. pumila***
   – Toes longer (> 20 μm) 9

9. (8) – Toe tips with short, separated spines (figs 86-87) **7. *L. boorali***
   – Claws or pseudoclaws conspicuous 10

10. (9) – Toes with relatively long claw (fig. 84) **8. *L. inermis***

   – Toes with pseudoclaw and accessory claw 11

11. (10) – Pseudoclaws long, slightly outcurved. Lorica strongly elongate (fig. 83) **9. *L. elegans***
   – Pseudoclaws shorter, straight (fig. 85) **10. *L. margalefi***

12. (2) – Toes ending in acute points, no claws nor pseudoclaws, toe tips may be asymmetrical 13
   – Toes with occasionally incompletely separated claws, or pseudoclaws 36

13. (12) – Antero-lateral corners angulate or rounded 14
   – Antero-lateral corners with acute projections 20

14. (13) – Dorsal plate anteriorly narrower, medially wider than ventral plate. Lorica ornamented. Head aperture margins smooth, dorsally convex, ventrally concave. Foot pseudosegment projecting. Toes parallel-sided, incurved distally to acute points (figs 88-89) **11. *L. venusta***
– Dorsal plate consistently wider than, or as wide as, ventral plate anteriorly 15

15. (14) – Toes short (13-35 μm), occasionally asymmetrical distally 16
– Toes slender, relatively longer (51-60 μm), smoothly tapering distally 18

16. (15) – Antero-lateral corners rounded, head aperture margins convex or nearly straight. Foot pseudosegment distinctly wider than long, parallel-sided. Toes relatively broad. A soft-loricate species (figs 90-97) **12. *L. hornemanni***
(see also *L. pustulosa* (fig. 98))
– Antero-lateral corners angulate. Foot pseudosegment not parallel-sided. 17

17. (16) – Transverse fold on ventral plate weak, no longitudinal folds. Head aperture margin slightly concave ventrally, nearly straight dorsally, occasionally with notches. Foot pseudosegment not projecting. Toe tips simple (fig. 99) **13. *L. tryphema***
– Ventral plate with an incomplete transverse, and longitudinal folds. Head aperture margins smooth, coincident, more or less straight. Foot pseudosegment with lateral projections, scarcely projecting. Shape of toe tips characteristic (figs 100-101, 319) **14. *L. nana***

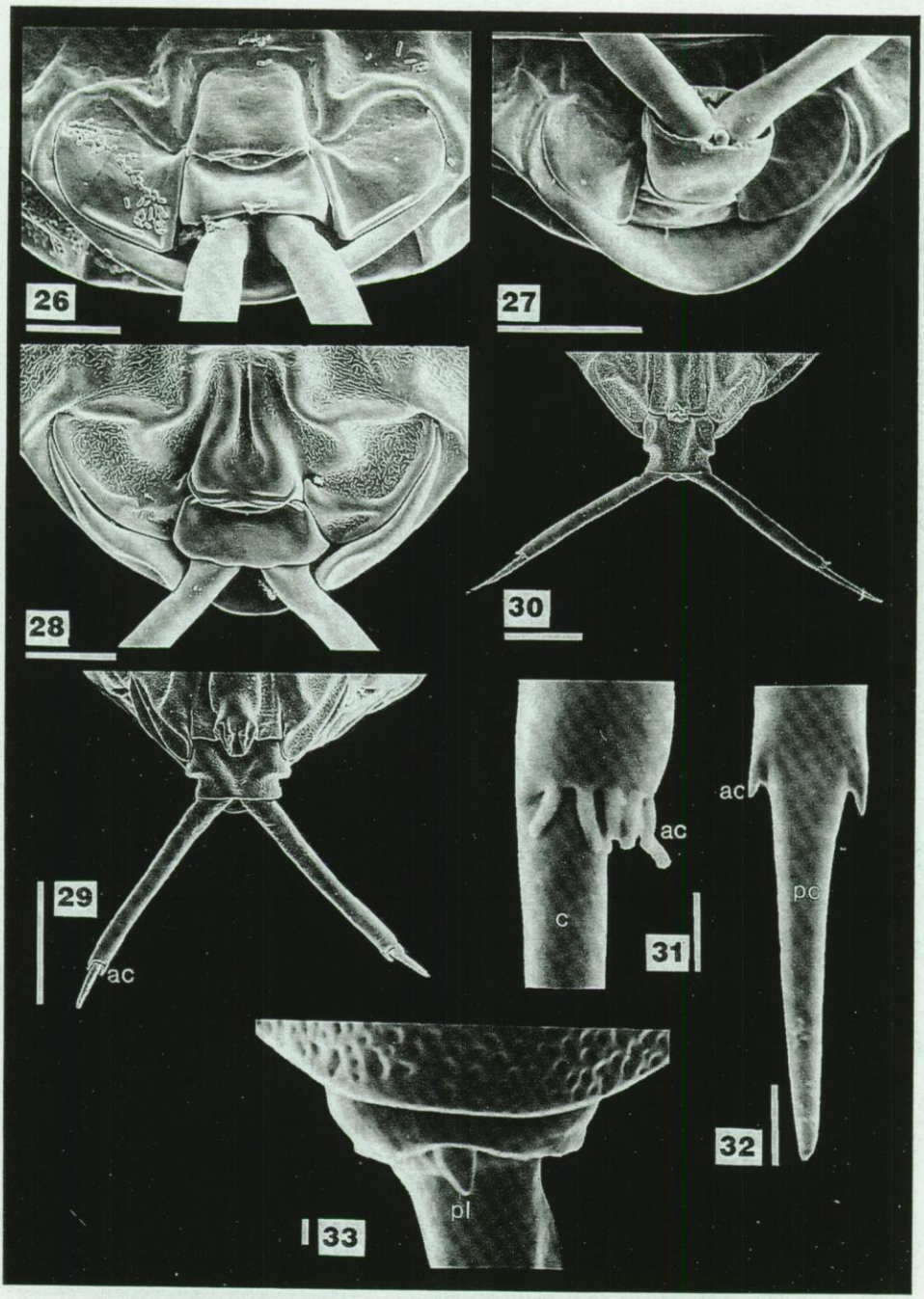
18. (15) – Head aperture margins nearly straight, lorica relatively wide (figs 103-104) **15. *L. nelsoni***
– Head aperture margins convex or broadly sinuate 19

19. (18) – Head aperture margin dorsally and ventrally convex, ventrally with median sinus. Lorica rounded (fig. 102) **16. *L. remanei***
– Head aperture margins ventrally and dorsally bilobate, lorica elongate (figs 105-106) **17. *L. melini***

20. (13) – Foot pseudosegment projecting . 21
– Foot pseudosegment not projecting 28

21. (20) – Dorsal plate anteriorly as wide as ventral plate, or lateral margins of ventral plate do not reach head aperture 22
– Dorsal plate anteriorly narrower than ventral plate 24

22. (21) – Head aperture margins strongly concave. Lateral margins of ventral plate end before reaching the anterior margin. Lorica smooth (fig. 107) **18. *L. rudescui***
– Head aperture margins nearly straight 23



Figs 26-33. *Lecane* spp., foot plate; toe and claw (S.E.M. photographs). 26, 27: *L. luna*; 28: *L. curvicornis*; 29: *L. arcula*; 30, 31: *L. eutarsa*, 31: insertion of claw on toe; 32, 33: *L. quadridentata*, 32: toe tip, 33: dorsal view of foot pseudosegment and toe.
Scale bars: 10 μm (figs 26-29), 1 μm (figs 31-33). ac: accessory claw, c: claw, pc: pseudoclaw (fused), pl: pedal lobe (26, 27, 32, 33: Turkey (Segers *et al.*, 1992); 28-31: Maracá Island, Roraima, Brazil).

23. (22) – Lateral margins of ventral plate reach anterior margin. Head aperture margins nearly straight. Lorica mostly ornamented (figs 113-114) **19. *L. pertica***
– Lateral margins of ventral plate end before reaching the anterior margin. Head aperture margins almost straight, ventrally with shallow concavity. Lorica smooth (fig. 112) **20. *L. deridderae***

24. (21) – Toes parallel-sided, with short tip 25
– Toes parallel-sided in the basal half only, smoothly tapering distally 26

25. (24) – Toes short, up to 35 μm. Foot pseudosegment parallel-sided. Head aperture margins slightly convex (figs 108-109) **21. *L. tabida***
– Toes long, over 40 μm. Foot pseudosegment robust, with lateral lobes. Head aperture margins slightly concave (figs 119-121) **22. *L. simonneae***

26. (24) – Foot pseudosegment with median constriction. Head aperture margins nearly straight, ventral plate width more than two thirds of length (figs 110-111) **23. *L. sola***
– Foot pseudosegment of different shape. Head aperture margin smoothly concave, ventral plate elongate 27

27. (26) – Foot pseudosegment with lateral lobes medially (figs 116-118) **24. *L. rhytida***
– Foot pseudosegment without lobes, slightly widened in distal half (fig. 115) **25. *L. donneri***

28. (20) – Posterior margin of foot plate rounded 29
– Posterior margin of foot plate with projections 35

29. (28) – Dorsal plate anteriorly as wide as ventral plate 30
– Dorsal plate anteriorly narrower than ventral plate 31

30. (29) – Ventral plate with smooth notches anteriorly. Lorica mostly ornamented. Head aperture margins almost straight. (figs 122-126) **26. *L. signifera***
(see also *L. jaintiaensis* (figs 127-128))
– Lateral margins of ventral plate smooth. Lorica elongate, smooth. Head aperture margins distinctly concave. (figs 129-131) **27. *L. pyrrha***

31. (29) – Dorsal plate medially at most as wide as ventral plate (figs 132-135) **28. *L. depressa***
– Dorsal plate medially wider than ventral plate 32

32. (31) – Lateral margins of ventral plate irregularly undulate, more or less parallel. Toes tapering from midway onwards (figs 136-137) **29. *L. lauterborni***

– Lateral margins of ventral plate smooth, curved. Toes incurved, with short point 33

33. (32) – Dorsal and ventral head aperture margins nearly straight (figs 138-141) **30. *L. levistyla***

– Dorsal and ventral head aperture margins strongly concave 34

34. (33) – Dorsal head aperture margin projects beyond ventral (figs 142-143) **31. *L. herzigi***

– Median part of ventral head aperture margin projects beyond dorsal (figs 144-145) **32. *L. ordwayi***

35. (28) – Dorsal plate medially at most as wide as ventral plate. Lorica relatively broad, smooth (figs 146-153) **33. *L. ligona***

– Dorsal plate medially wider than ventral plate. Lorica elongate, mostly ornamented (figs 154-174) **34. *L. ludwigii***

36. (12) – Antero-lateral corners angulate or rounded 37

– Antero-lateral corners with acute projections 54

37. (36) – Dorsal plate anteriorly wider than or as wide as ventral plate 38

– Dorsal plate anteriorly narrower than ventral plate 43

38. (37) – Toes with pseudoclaws (figs 175-176) **35. *L. candida***

– Toes with real claws, these may be incompletely separated 39

39. (38) – Lorica as long as, or only slightly longer than, wide 40

– Lorica more elongate 41

40. (39) – Lorica relatively soft, animal large. Dorsal plate wider than long. A cold stenothermal species (fig. 177) **36. *L. latissima***

(see also **147. *L. thailandensis***: p. 199, figs 517-525)

– Lorica stiffer, animal small. Dorsal plate longer than wide. A warm stenothermal species (fig. 183) **37. *L. ruttneri***

41. (38) – Claws long (> 15 μm)(figs 184-185) **38. *L. elongata***

– Claws short (< 10 μm) 42

42. (41) – Lorica stiff, lateral margins of ventral plate more or less parallel-sided. Foot plate especially indicated. Claws completely separated (figs 181-182) **39. *L. urna***

– Lorica relatively soft, lateral margins of ventral plate diverging anteriorly. Foot plate normal. Claws incompletely separated (figs 178-180) **40. *L. abanica***

43. (37) – Ventral plate without longitudinal folds, transverse fold complete or incomplete. Prepedal fold broad, rounded posteriorly. Toes with pseudoclaws. Mostly large species 44

– A pair of longitudinal folds on ventral plate present, transverse fold

incomplete. Prepedal fold elongate, posteriorly with median projection. Toes with real claws, these may be incompletely separated. Mostly small species 49

44. (43) - Toes particularly short, slender, pseudoclaws relatively long. Shape of ventral head aperture margin characteristic (fig. 186) **41. *L. proiecta***
– Toes not particularly slender, ventral head aperture margin different 45

45. (44) – Head aperture margins smooth, almost straight (fig. 187) **42. *L. grandis***
– At least ventral head aperture margin sinuate or concave, or with rounded lateral projections 46

46. (45) – Ventral and dorsal head aperture margins broadly concave, weakly undulate. Lateral margins of ventral plate with rounded extensions in posterior region (fig. 190) **43. *L. lateralis***
– Ventral head aperture margin medially with a narrow sinus, dorsal almost straight. Ventral plate with smoothly curved lateral margins in posterior region 47

47. (46) – Ventral head aperture margin with median sinus, an intermediate straight part and more or less rounded lateral projections, extending beyond the dorsal head aperture margin or not (figs 191-194) **44. *L. papuana***
– Ventral head aperture margin broadly bilobate, mostly projecting beyond dorsal 48

48. (47) – Transverse fold on ventral plate incomplete, weak. Toes relatively long (> 70µm)(figs 188-189) **45. *L. braumi***
– Transverse fold on ventral plate complete, strong. Toes relatively short (< 70µm)(figs 195-196) **46. *L. elsa***

49. (43) – Claws relatively long (claw l. > 1/2 l. toe) 50
– Claws short 51

50. (49) – Foot pseudosegment scarcely projecting. Lorica distinctly longer than wide, mostly smooth (fig. 197) **47. *L. tenuiseta***

– Foot pseudosegment distinctly projecting. Lorica only slightly longer than wide, ornamented (figs 198-199) **48. *L. doryssa***

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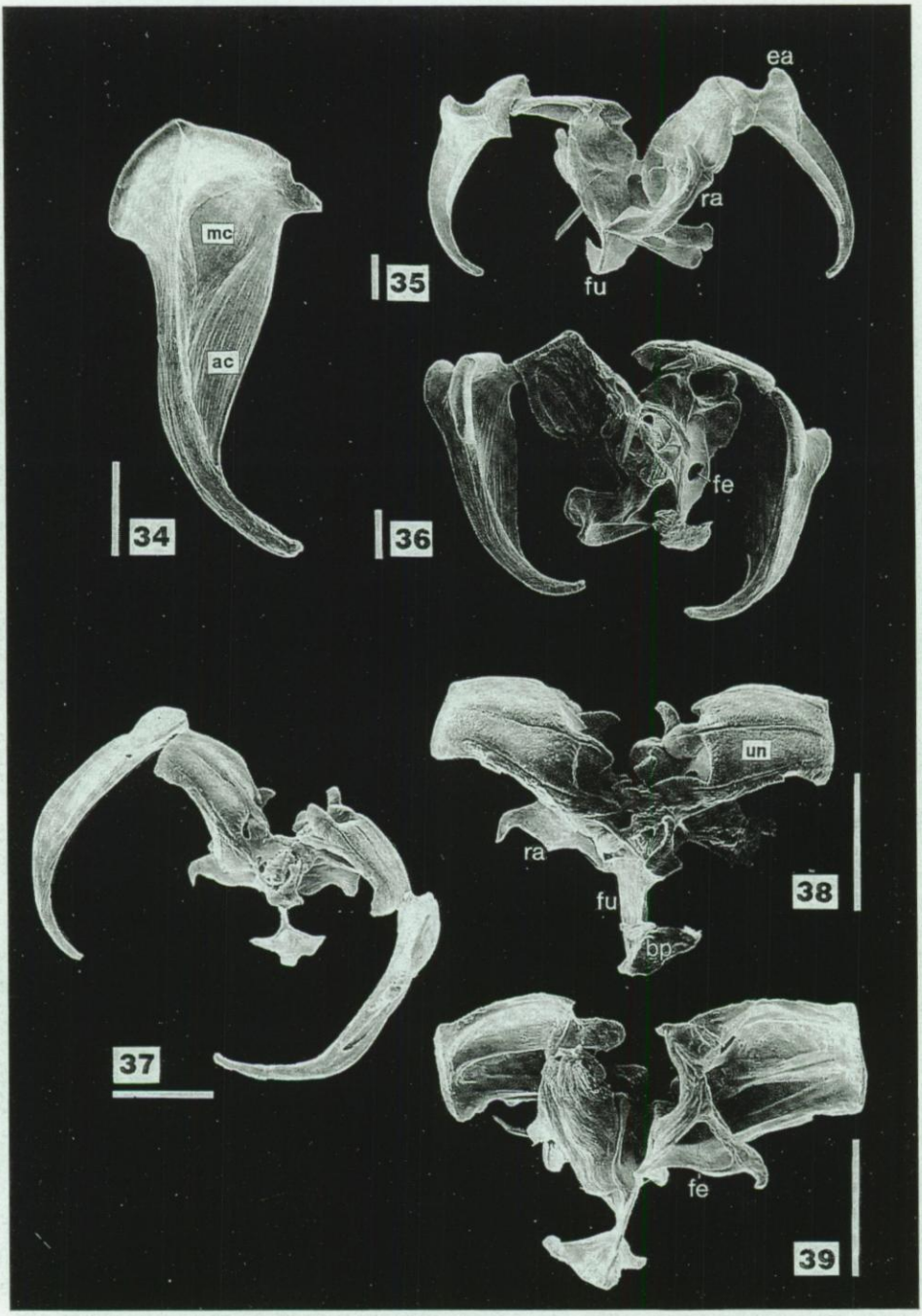
Figs 34-39. Lecane spp., trophi (S.E.M. photographs). 34-36: *L. ungulata*. 34: manubrium, 35: trophi, dorsal view, 36: trophi, ventral view. 37-39: *L. bulla*. 37: trophi, ventral view, 38: fulcrum, rami and unci, ventral view, 39: ditto, dorsal view.
Scale bars: 10 µm. ac: anterior cavity of manubrium, bp: basal plate of fulcrum, ea: exterior apophysis of manubrium, fe: fenestra in ramus, fu: fulcrum, mc: medial cavity of manubrium, ra: ramus, un: uncus (34-39: pond near Lake Glubokoe, Russia).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51. (49) – Foot pseudosegment large, distinctly projecting, semi-circular (figs 206-207) **49. *L. sagula***
– Foot pseudosegment not semi-circular 52

52. (51) – Foot pseudosegment parallel-sided, projecting. Foot plate dorsally with nearly straight transverse ridge (figs 202-203) **50. *L. subtilis***
– Foot pseudosegment scarcely projecting, occasionally with lateral lobes or dilated distally 53

53. (52) – Animals small (VPl. < 65 µm), toe length (incl. claw) under 30 µm. A common, cosmopolitan species (figs 200-201, 204-205) **51. *L. pusilla***
– Animals larger (VPl. > 65 µm), toe length (incl. claw) over 30 µm. A rare warm-water species (figs 208-209) **52. *L. aeganea***
(see also *L. formosa* (figs 210-211))

54. (36) – Claws with basal swelling 55
– Claws smoothly tapering, or claws incompletely separated, or toes with pseudoclaws 56

55. (54) – Lorica relatively broad, occasionally soft. Foot pseudosegment squarish, parallel-sided (figs 212-213) **53. *L. hastata***
– Lorica more elongate, stiff. Foot pseudosegment elongate, with lateral lobes (figs 214-216) **54. *L. climacois***

56. (54) – Foot pseudosegment scarcely projecting 57
– Foot pseudosegment clearly projecting 70

57. (56) – Toes with pseudoclaws 58
– Toes with real claws, these may be incompletely separated 66

58. (57) – Posterior margin of ventral plate with distinct, variably shaped projection (figs 217-220) **55. *L. leontina***
(see also **148. *L. donyanaensis***: p. 201, fig. 526)
– Posterior margin of foot plate smoothly rounded or broadly truncate 59

59. (58) – Dorsal plate anteriorly narrower than ventral plate 60
– Dorsal plate anteriorly as wide as, or wider than ventral plate 65

60. (59) – Transverse fold on ventral plate complete, lunate, or incomplete, no longitudinal folds. Prepedal fold rounded posteriorly. Mostly large species 61
– Transverse fold on ventral plate incomplete, longitudinal folds present. Prepedal fold posteriorly with median projection. Small species 64

61. (60) – Pseudoclaws 20 µm or longer (fig. 221) **56. *L. ungulata***
(see also *L. tabulifera* (figs 222-223)
– Pseudoclaws shorter than 20 µm 62

62. (61) – Anterior margin of dorsal plate much narrower than that of ventral plate. Head aperture margins strongly lunate, antero-lateral spines broad-based (figs 224-225) **57. *L. luna***
– Anterior margin of dorsal plate only slightly narrower than that of ventral plate. Head aperture margins straight or concave, antero-lateral spines narrow-based 63

63. (62) – Toes longer than 45 µm (figs 226-233) **58. *L. curvicornis***
– Toes shorter than 45 µm (figs 234-236) **59. *L. rhenana***

64. (60) – Dorsal plate with characteristic ornamentation. Head aperture margins slightly concave. Posterior margin of ventral plate smoothly rounded (figs 240-241) **60. *L. infula***
– Dorsal plate with pattern of folds. Head aperture margins slightly convex. Posterior margin of ventral plate truncate (figs 237-239) **61. *L. flexilis***

65. (59) – Antero-lateral spines extremely long (> 25 µm). Lorica slightly longer than wide (figs 242-244) **62. *L. mucronata***
– Antero-lateral spines shorter. Lorica elongate (fig. 245) **63. *L. eylesi***
(see also *L. leura* (fig. 246))

66. (57) – Posterior projection of foot plate present, with acutely pointed, upward-curved corners (figs 252-253) **64. *L. bifastigata***
– Posterior margin of foot plate smoothly rounded or truncate 67

67. (66) – Foot plate distinctly separated, projecting 68
– Foot plate not projecting 69

68. (67) – Dorsal plate medially narrower than ventral plate, lorica relatively broad (figs 254-255) **65. *L. eswari***
(see also **149. *L. shieli***: p. 203, figs 527-528)
– Dorsal plate medially wider than ventral plate, lorica elongate (figs 250-251) **66. *L. schraederi***

69. (67) – Lateral margins of ventral plate smooth, ventral plate relatively broad. Dorsal plate medially more or less as wide as ventral plate. Toes more than twice as long as claws. Foot pseudosegment with lateral lobes (figs 247-249) **67. *L. aspasia***
– Lateral margins of ventral plate with anterior notches, ventral plate relatively elongate. Dorsal plate appreciably wider medially than ventral plate. Toes about twice as long as claws. Foot pseudosegment parallel-sided (figs 256-258) **68. *L. stichoclysta***

70. (56) – Antero-lateral spines with barb. Lorica characteristically ornamented (figs 259-260) **69. *L. satyrus***
– Antero-lateral spines simple, lorica smooth or ornamented 71

71. (70) – Antero-lateral projections large, semi-circular, with an anterior lamella (figs 261-263) **70. *L. boettgeri***
– Antero-lateral projections spiniform 72

72. (71) – Foot plate especially separated, projecting (figs 268-269)**71. *L. crepida***
– Foot plate not projecting 73

73. (72) – Antero-lateral spines separated from the ventral plate 74
– Antero-lateral spines are extensions of the ventral plate 75

74. (73) – Lorica elongate, antero-lateral spines long (7-10 µm)(figs 264-265) **72. *L. aculeata***
– Lorica less elongate, antero-lateral spines short (3-5 µm)(figs 266-267) **73. *L. arcula***

75. (73) – Toes with real, completely separated claws, these occasionally inserted eccentrically 76
– Toes with pseudoclaws or incompletely separated claws 79

76. (75) – Claw inserted medially 77
– Claw inserted eccentrically 78

77. (76) – Lateral margins of ventral plate straight, parallel anteriorly. Foot pseudosegment with lateral lobes (figs 270-271) **74. *L. robertsonae*** (see also *L. pelatis* (figs 272-273))
– Lateral margins of ventral plate converging anteriorly. Foot pseudosegment parallel-sided (figs 274-275) **75. *L. verecunda***

78. (76) – Foot pseudosegment with lateral lobes (figs 276-277) **76. *L. eutarsa***
– Foot pseudosegment parallel-sided, as long as toe without claw (figs 278-279) **77. *L. kutikowa***

79. (76) – Toes with incompletely but bilaterally separated, straight claws (figs 280-285) **78. *L. haliclysta***
– Toes with pseudoclaws 80

80. (79) – Transverse fold on ventral plate incomplete, no longitudinal folds. Pseudoclaws straight (figs 286-288) **79. *L. mira***
– Ventral plate with incomplete transverse and longitudinal folds. Pseudoclaws short, curved 81

81. (80) – Lorica ornamented, elongate. Foot pseudosegment elongate (figs 290-294) **80. *L. stichaea***
– Lorica smooth, less elongate. Foot pseudosegment squarish (fig. 289) **81. *L. intrasinuata***

82. (1) – Toes partly fused (10-90%), held together or, rarely, spread 83
– Toes totally fused, occasionally with minute terminal fissure only, or with non-fused claws 100

Specimens with a single toe, having indistinctly separated claws may be mistaken as having incompletely fused toes (e.g., *L. gwileti*)).

83. (82) – Lorica with a pair of ventral spines (figs 295-297) **82. *L. spiniventris***
– No ventral spines 84

84. (83) – Body illoricate: dorsal or ventral plate hardly distinguishable. Toe(s) widest medially (figs 298-300) **83. *L. agilis***
(see also *L. bryophila* (fig. 301))
– Lorica with dorsal and ventral plates, these may be soft 85

85. (84) – Antero-lateral corners angulate or rounded 86
– Antero-lateral corners with acute projections, or anterior margin of ventral plate with acute or rounded projections laterally 97

86. (85) – Dorsal plate anteriorly wider than or as wide as ventral plate 87
– Dorsal plate anteriorly narrower than ventral plate 92

87. (86) – Toe with swollen basis 88
– Toe(s) more or less parallel-sided, tapering, or widest medially 89

88. (87) – Toes fused basally (figs 302-303) **84. *L. kluchor***
– Toes fused over at least half their length (figs 304-305)
85. *L. syngenes*

89. (87) – Toes without distinctly separated claws 90
– Toes with claws 91

90. (89) – Toes fused up to median point, smoothly tapering. Dorsal plate relatively wide (figs 306-307) **86. *L. minuta***
– Toes fused basally, occasionally swollen in their basal half, tips curved. Dorsal plate longer than wide (figs 308-311) **87. *L. paradoxa***
(see also *L. nana* f. *monostyla* (fig. 319))

91. (89) – Toes fused only basally (figs 315-318) **88. *L. paxiana***
– Toes fused over at least half their length (figs 312-314) **89. *L. uenoi***

92. (86) – Foot pseudosegment simple 93
– Foot pseudosegment with lateral lobes 95

93. (92) – Toes fused only basally (figs 322-326) **90. *L. undulata***
(see also *L. tenuiseta* (fig. 197))
– Toes fused over more than one third of their length 94

94. (93) – Claws short (< 7 μm). Dorsal plate smooth or ornamented (figs 327-332) **91. *L. inopinata***
– Claws long (> 8 μm). Dorsal plate with pair of distinct longitudinal folds (figs 334-335) **92. *L. braziliensis***

95. (92) – Foot plate with a pair of pointed posterior projections (figs 320-321) **93. *L. junki***
– No such projections 96

96. (95) – Claws long (l > 7μm), completely separated. Lorica strongly ornamented (figs 336-338) **94. *L. dumonti***
– Claws short (l < 7 μm), incompletely separated. Lorica weakly ornamented (figs 339-340) **95. *L. inconspicua***
(see also *L. aeganea* (figs 208-209))

97. (85) – Antero-lateral projections acute, head aperture margins straight 98
– Antero-lateral projections of ventral plate rounded, ventral head aperture margin with median sinus 99

98. (97) – Toes with completely separated claws (figs 343-344) **96. *L. sympoda***
– Toes without claws, toe tips incurved distally (figs 341-342) **97. *L. elasma***

99. (98) – Toe fused basally, claws touching together (figs 345-347) **98. *L. blachei***
– Toe fused up to median point (figs 348-349) **99. *L. nwadiaroi***

100. (82) – Toe with claws or terminal fissure 101
– Toe smoothly tapering to point 135

101. (100) – Illoricate species: dorsal or ventral plate hardly distinguishable 102
– Lorica with dorsal and ventral plates, these may be soft 103

102. (101) – Claws short, diverging. Coxal plates with spines (figs 350-353) **100. *L. bifurca***
(see also *L. dysoarata* (fig. 354))
– Claws long. Coxal plates normal (figs 355-357) **101. *L. solfatara***

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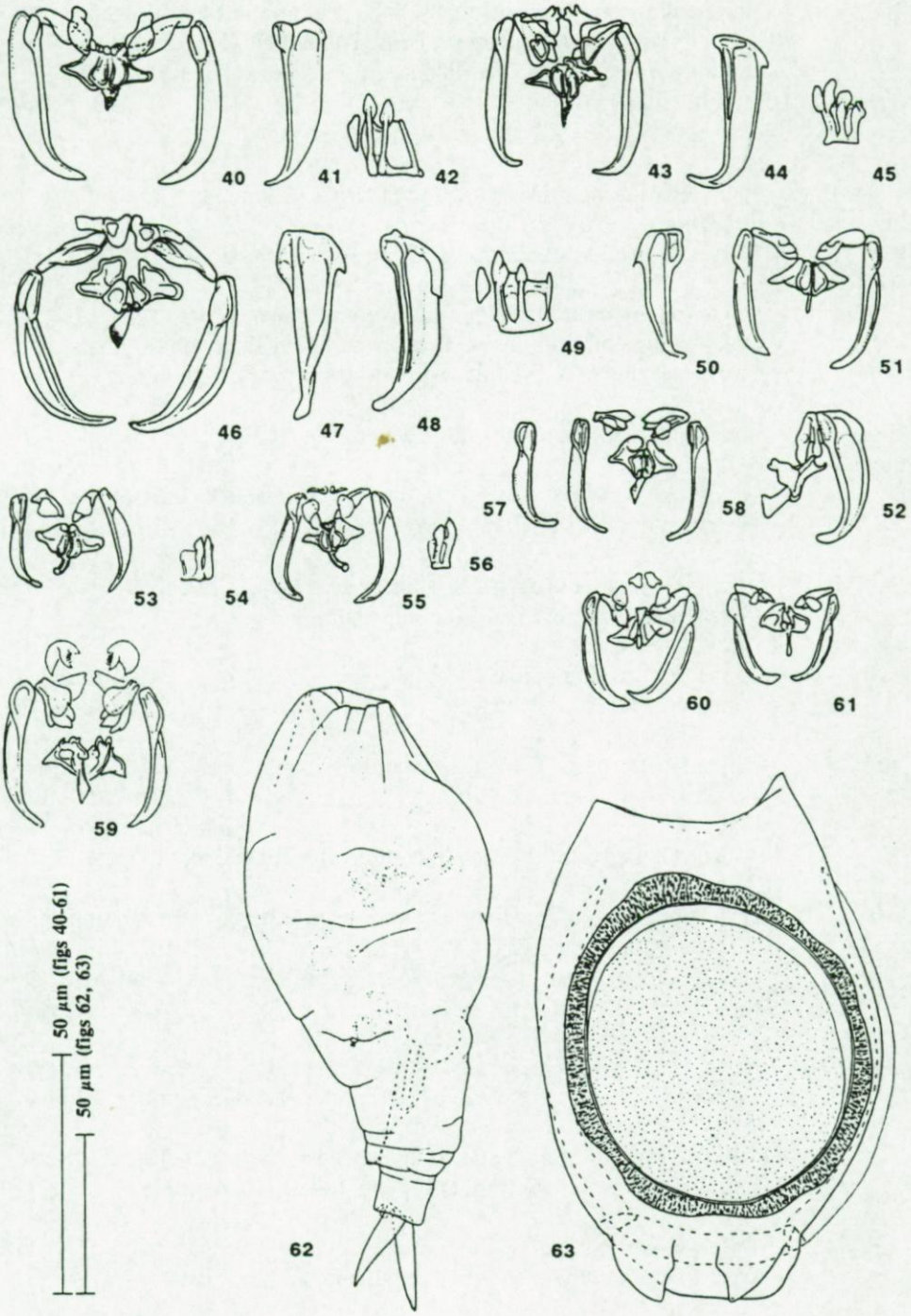
Figs 40-61. Lecane spp., trophi. 40-42: *L. nelsoni*. 40: ventral view, 41: lateral view of manubrium, 42: uncus. 43-45: *L. hornemanni*. 43: ventral view, 44: lateral view of manubrium, 45: uncus. 46-49: *L. latissima*. 46: ventral view, 47, 48: (semi-)lateral view of manubrium, 49: uncus. 50-52: *L. signifera*. 50: lateral view of manubrium, 51: ventral view, 52: lateral view. 53-54: *L. minuta*. 53: ventral view, 54: uncus. 55-56: *L. spiniventris*. 55: ventral view, 56: uncus. 57-58: *L. abanica*. 57: lateral view of manubrium, 58: ventral view. 59: *L. ludwigii*, ventral view; 60: *L. haliclysta*, ventral view; 61: *L. dumonti*, ventral view.
Figure 62: *L. depressa*, male.
Figure 63: *L. lamellata*, lorica with resting egg.
(40-49, 53-58: after Segers, 1994; 50-52, 59-61: Lagoon 7 km. S of Boa Vista, Roraima, Brazil; 62: pond near Lake Glubokoe, Russia; 63: Saudi Arabia (Segers & Dumont, 1993b).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50 µm (figs 40-61)
50 µm (figs 62, 63)

103. (101) – Lorica egg-shaped, occasionally soft. Ventral and dorsal head aperture margins with deep sinuses. Toe either with terminal fissure and long pseudoclaws or with fused pseudoclaws, accessory claws present (figs 358-365) **102. *L. bulla***
– Lorica dorso-ventrally flattened, not egg-shaped 104

104. (103) – Head aperture margin dorsally with a pair of long, curved median projections, ventrally concave (figs 366-367) **103. *L. quadridentata***
– Dorsal head aperture margin without such projections 105

105. (104) – Dorsal plate anteriorly wider than ventral plate 106
– Dorsal plate anteriorly as wide as or narrower than ventral plate, or lateral margins of dorsal plate do not reach the head aperture 111

106. (105) – Toe broad, with relatively short claws (figs 368-369) **104. *L. psammophila***
(see also *L. mitella* (fig. 370))
– Toe normal, claws relatively long (>5 μm) 107

107. (106) – Ventral head aperture margin broadly sinuate 108
– Ventral head aperture margin almost straight 109

108. (107) – Lorica with simple pattern of folds (figs 371-372) **105. *L. galeata***
– Lorica conspicuously ornamented (figs 373-374) **106. *L. myersi***

109. (107) – Lorica stiff, robust. Claws completely separated, relatively short (figs 375-377) **107. *L. obtusa***
(see also *L. whitfordi* (figs 378-379))
– Lorica relatively soft. Claws incompletely separated, elongate 110

110. (109) – Claw more than half as long as toe. Antero-lateral corners angulate, lorica soft (figs 380-382) **108. *L. subulata***
– Claw relatively shorter. Antero-lateral corners rounded, lorica stiff (figs 383-385) **109. *L. perpusilla***

111. (105) – Posterior margin of prepedal fold with median projection. Ventral plate with incomplete transverse fold and a pair of longitudinal folds 112
– Posterior margin of prepedal fold rounded. No longitudinal folds on ventral plate, transverse fold complete, lunate or incomplete. 119

112. (111) – Antero-lateral corners of lorica with acute projections 113
– Antero-lateral corners of lorica angulate 115

113. (112) – Coxal plates sickle-shaped, projecting (figs 386-388) **110. *L. spinulifera***
– Coxal plates rounded 114

114. (113) – Head aperture margins almost straight, parallel (fig. 389) **111. *L. acanthinula***
– At least ventral head aperture margins strongly concave (figs 401-403) **112. *L. margarethae***

115. (112) – Ventral head aperture margin broadly sinuate, generally concave or with a pair of shallow, pointed sublateral projections (figs 404-407) **113. *L. punctata***
– Ventral and dorsal head aperture margins nearly straight 116

116. (115) – Toes with completely separated claws 117
– Toes with terminal fissure or inconspicuously separated claws 118

117. (116) – Foot plate relatively broad, about as wide as toe length (figs 390-392) **114. *L. furcata***
– Foot plate relatively narrow, distinctly narrower than toe length (figs 393-395) **115. *L. rugosa***

118. (116) – Toe parallel-sided (fig. 400) **116. *L. gwileti***
– Toe constricted in distal half (figs 396-399) **117. *L. asymmetrica***

119. (111) – Dorsal plate medially wider than ventral 120
– Dorsal plate medially narrower than, or at most as wide as ventral 127

120. (119) – Lateral margins of dorsal plate end before head aperture margins 121
– Lateral margins of dorsal plate reach head aperture margins 122

121. (120) – Posterior margin of ventral plate with broad projection (figs 408, 410-411) **118. *L. lamellata***
(see also *L. flabellata* (figs 416-417))
– Posterior margin of ventral plate rounded or smoothly truncate (figs 409, 415) **119. *L. thalera***

122. (120) – Toe nearly parallel-sided 123
– Toe widest medially 126

123. (122) – Antero-lateral corners with sharp, narrow-based projections. Ventral head aperture margin with a pair of shallow, acute projections (figs 418-420) **120. *L. ivli***
– Antero-lateral corners angulate or with sharp, broad-based projections. No such projections on ventral head aperture margin 124

124. (123) – Toe relatively short, slightly wider in basal than in distal half. Lateral sulci shallow (figs 429-431) **121. *L. scutata***
– Toe long, lateral sulci deep 125

125. (124) – Ventral and dorsal head aperture margins variable: straight to strongly concave (figs 421-428, 438) **122. *L. lunaris***

– Dorsal head aperture margin with squarish median notch (figs 434-435) **123. *L. pideis***

126. (122) – Head aperture margins concave ventrally and dorsally. Antero-lateral corners angulate (figs 436-437) **124. *L. rhopalura***
– Head aperture margins nearly straight. Antero-lateral projections present (figs 432-433) **125. *L. copeis***

127. (119) – Both ventral and dorsal head aperture margins strongly concave (figs 439-443) **126. *L. cornuta***
– At least dorsal head aperture margin straight, convex or broadly bilobate 128

128. (127) – Dorsal and ventral head aperture margin broadly bilobate, lorica ornamented with rows of spinules (figs 444-445) **127. *L. armata***
– Dorsal head aperture margin straight or convex 129

129. (128) – Dorsal head aperture margin convex, with broad, blunt median projection (figs 446-447) **128. *L. gillardi***
– Dorsal head aperture margin straight 130

130. (129) – Ventral head aperture margin broadly sinuate 131
– Ventral head aperture with narrow median sinus and a pair of rounded or acute lateral projections 132

131. (130) – Dorsal plate nearly circular (fig. 448) **129. *L. amazonica***
– Dorsal plate elongate, lateral margins less curved (figs 449-450) **130. *L. nigeriensis***

132. (130) – Lateral projections on ventral head aperture margin rounded 133
– Lateral projections on ventral head aperture margin sharp 134

133. (132) – Claws about half as long as toe. Foot pseudosegment squarish (figs 451-452) **131. *L. unguitata***
– Claws less than one third of toe length. Foot pseudosegment widest distally (figs 453-454) **132. *L. stevensae***

134. (132) – Lateral projections on ventral head aperture margin broad-based, bearing distinct, sharp inwardly-directed spines. Toe mostly widest basally (figs 455-457) **133. *L. stenroosi***
– Lateral projections on ventral head aperture margin double: lateral pair rounded, median pair sharp. Toe parallel-sided (figs 458-459) **134. *L. sylviae***

135. (100) – Dorsal plate with lateral extensions (figs 460-462) **135. *L. monostyla***
– Dorsal plate without such extensions 136

136. (135) – Dorsal plate anteriorly wider than, or as wide as the ventral 137

– Dorsal plate anteriorly narrower than ventral 138

137. (136) – Head aperture margins nearly straight or more or less convex (figs 466-470) **136. *L. pyriformis***
– Head aperture margins strongly concave (figs 463-465) **137. *L. pawlowskii***

138. (136) – Antero-lateral corners angulate 139
– Antero-lateral corners with sharp projections 140

139. (138) – Dorsal and ventral head aperture margins straight or smoothly concave (figs 471-477) **138. *L. closterocerca***
(see also *L. symoensi* (fig. 483))
– Ventral head aperture margin broadly sinuate, dorsal nearly straight (figs 478-481) **139. *L. arcuata***

140. (138) – Small antero-lateral spines present, ventral and dorsal head aperture margins straight (fig. 482) **140. *L. opias***
– Antero-lateral projections large, ventral head aperture margin strongly concave 141

141. (140) – Lateral margins of dorsal plate reach head aperture margin 142
– Lateral margins of dorsal plate do not reach head aperture margin 145

142. (141) – Posterior margin of foot plate with projections (figs 484-485) **141. *L. batillifer***
– Posterior margin of foot plate rounded 143

143. (142) – Anterior margin of dorsal plate about as wide as that of ventral plate (fig. 505) **142. *L. marchantaria***
– Anterior margin of dorsal plate narrower than that of ventral plate 144

144. (143) – Dorsal head aperture margin concave or nearly straight, broad, foot pseudosegment not projecting (figs 486-501) **143. *L. hamata***
– Dorsal head aperture margin nearly straight, narrow, foot pseudosegment projecting (figs 502-504) **144. *L. thienemanni***

145. (141) – Lorica without special markings. (fig. 506) **145. *L. decipiens***
– Lorica, especially lateral parts and posterior part of ventral plate, variably pustulated. (fig. 507) **146. *L. serrata***

Descriptions

1. *Lecane calcaria* Harring & Myers, 1926
Figs 64-65

Harring & Myers 1926 p. 381 plate 33 figs 3, 4; Kutikova 1970 p. 460-461 fig. 633; Koste 1978 p. 205 plate 68 figs 11a, b; Koste & Böttger 1992 p. 289-290 figs 9a, b.

Type locality
Swamp at Oceanville, near Atlantic City, New Jersey, U.S.A.

Differential diagnosis
This *Lecane* can be confused with other soft-loricate species such as *L. clara*, *L. palinacis* or *L. inermis*. It is characterised by its 'firm, extremely large, curved and pointed posteriorly' and projecting coxal plates, and by the particular shape of its toes.

Description
Illoricate *Lecane*. Outline of contracted animal broadly reverse-ovate, with almost straight anterior margin. Coxal plates remarkably large, sickle-shaped, bent inwards. Foot pseudosegment simple, relatively large, projecting. Toes broad basally, tapering to sharp points, outcurved. No claws, or weak pseudoclaws.

Measurements: Tot. l. 65-138, body l. 50-74, body w. 41-75, anterior margin w. 42-60, toe l. 15-31.

Distribution
Known from the type locality, and from Ecuador. The species has also been recorded from ponds near Krasnodarsk, Russia (non-illustrated record).

2. *Lecane niothis* Harring & Myers, 1926
Figs 66-67

Harring & Myers 1926 p. 382 plate 33 figs 5, 6; Wang 1961 p. 128 figs 105a, b; Koste 1978 p. 203 plate 68 figs 2a, b.

Type locality
Manset, Mount Desert Island, Maine, U.S.A.

Differential diagnosis
L. niothis can be confused with *L. clara*, but its toes are shorter, and are not swollen medially. The species differs from *L. rhacois* by the absence of differentiated tips on its toes, and by its toes tapering from medially onwards.

Description
Illoricate *Lecane*. Lorica shape variable, only slightly longer than wide when contracted, with conspicuous ornamental folds. Foot pseudosegment not projecting,

coxal plates rounded. Toes elongate, parallel-sided to medially then tapering to point, no claws.

Measurements: Tot. l. 70-74, Lo l. 50-61, Lo. w. 48-60, toe l. 20-21.

Distribution
Recorded from North America and China, a non-illustrated record from Sweden (Pejler & Bērziņš, 1994).

3. *Lecane rhacois* Harring & Myers, 1926
Figs 68-69

Harring & Myers 1926 p. 379 plate 17 figs 1, 2; Koste 1978 p. 220 plate 73 figs 3a, b.

Type locality
Hyattsville, near Washington, D.C., U.S.A.

Differential diagnosis
L. rhacois differs from other illoricate *Lecane*'s with two toes (*L. clara*, *L. niothis*, *L. palinacis*) by its elongate, parallel-sided toes bearing differentiated tips. The shape of its coxal plates, and absence of claws distinguish the species from *L. palinacis*.

Description
Illoricate *Lecane*. Lorica shape variable, only slightly longer than wide when contracted. Foot pseudosegment projecting. Coxal plates rounded. Toes elongate, parallel-sided, bearing differentiated tips, no real claws.

Measurements: Tot. l. extended 140, contracted 100, toe l. 40.

Distribution
A single record from North America only.

4. *Lecane clara* (Bryce, 1892)
Figs 70-73, 508-509

Synonyms: *L. beauchampi* (von Hofsten, 1923)
L. longidactyla (Edmondson, 1948) Segers, 1993

Bryce 1892 p. 271 text fig. (*Distyla clara*); Murray 1913c p. 556 plate 22 fig. 6 (*Cathypna clara*); Harring 1913a p. 60 (*Lecane clara*); von Hofsten 1923 p. 851 fig. 5 (*Diglena beauchampi*); Harring & Myers 1926 p. 378 plate 17 figs 3, 4; Hauer 1931 p. 10-11 fig. 4; Wiszniewski 1934a p. 149-150 plate 6 figs 9a, b; Wiszniewski 1934b p. 381-382 plate 63 figs 74, 75; Edmondson 1948 p. 150-152 figs 8-13 (*Proales longidactyla*); Kutikova 1970 p. 461 fig. 636; Koste 1978 p. 205-206 plate 68 figs 4a-e; Koste & Shiel 1990 p. 19-20 plate 8 fig. 5; Segers 1993 p. 52.

Type locality
Sandown, U.K.

Differential diagnosis
Lecane clara cannot be mistaken for any other species of *Lecane* by its soft lorica and by its characteristic elongate toes, which are broadest medially.

Description
Illoricate *Lecane*. Body easily deformed, shape inconsistent. Foot pseudosegment not projecting, coxal plates absent. Toes elongate, broadest medially, tapering to point, no claws. Male: figs 508-509 (see Wiszniewski, 1934a).

Measurements: Tot. l. 120, Lo l. (living animals) 170-200, (contracted) 80-85, Lo. w. up to 51, toe l. 28-40, male tot. l. 110-115.

Distribution
Cosmopolitan. Not uncommon, occasionally in the psammon.

Note
Two more illoricate *Lecane*'s apparently are close to *L. clara* and *L. niothis*: *L. tenua* Myers, 1936a (Figure 75) and *L. inquieta* Myers, 1936a (Figure 74, paratype in PANS), both known from their type locality only (both species are from the hygropsammon of Lenape and Union Lakes, New Jersey, U.S.A.). They differ from *L. clara* and *L. niothis* by their size and, from *L. clara*, by the shape of their toes.
Measurements:
– *L. tenua*: DPl. 70, VPl. 85, Lo. w. 60, toe l. 25.
– *L. inquieta*: DPl. 96, DPw. 90, VPl. 101, toe l. 35.

5. ***Lecane palinacis*** Harring & Myers, 1926
Figs 76-78

Harring & Myers 1926 p. 380-381 plate 32 figs 3, 4; Koste 1978 p. 220 plate 73 figs 7a, b; Segers 1991b p. 118 fig. 5.

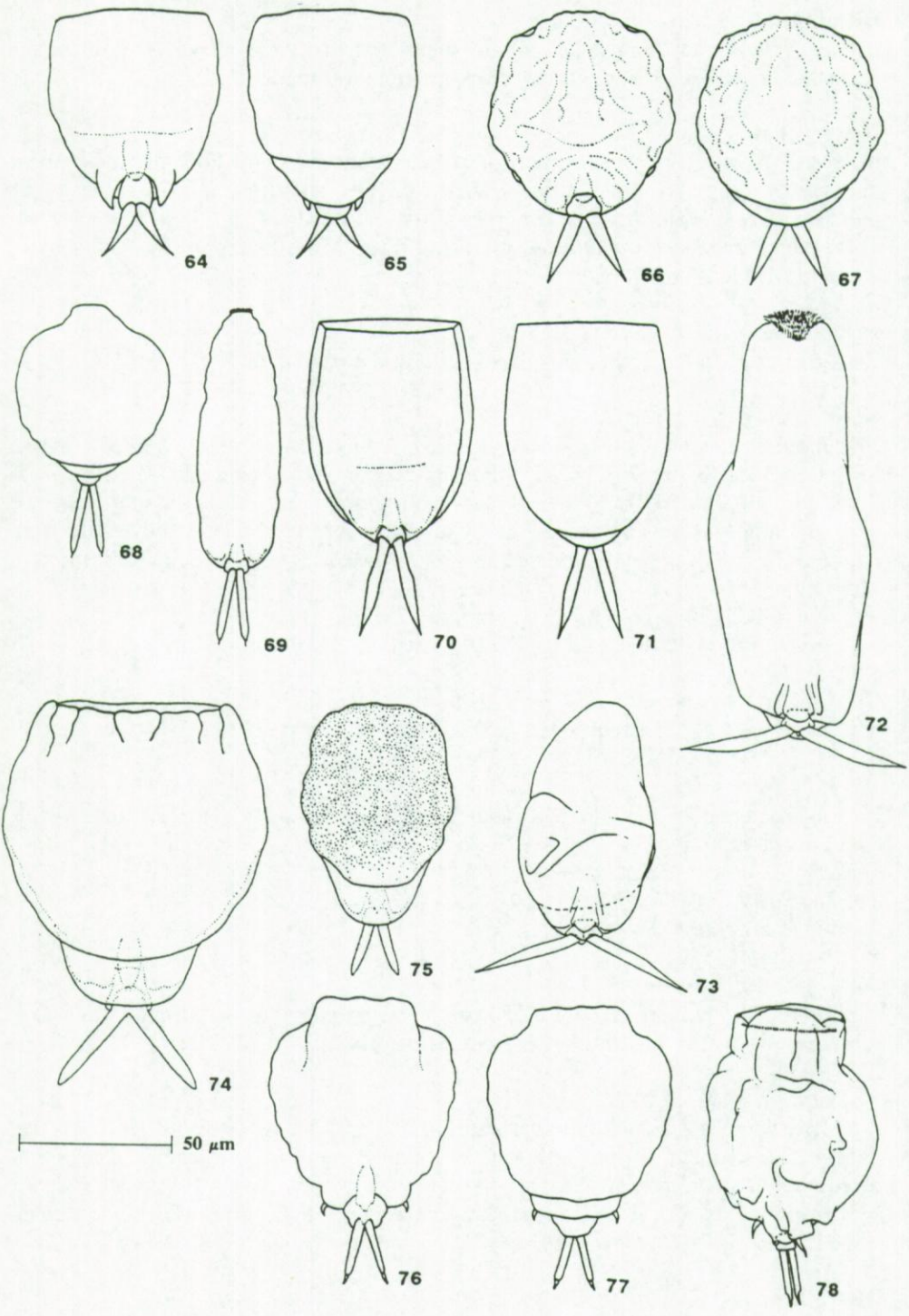
Type locality
Around Washington, D.C., U.S.A.

Differential diagnosis
L. palinacis can be confused with *L. clara* and *L. niothis*, but is distinguished by the presence of coxal spines and by its toes bearing claws.

Description
Illoricate *Lecane*. Lorica shape variable, nearly as wide as long when contracted. Foot pseudosegment not projecting. Coxal plates spiniform, projecting. Toes elongate, parallel-sided, bearing distinct claws.

Measurements: Tot. l. extended 120, contracted 75-84, body l. 60, w. 47, coxal spine l. 4, toe l. 14-16, claw l. 4.

Distribution
District of Columbia (U.S.A.), and Santa Cruz, Galàpagos Islands.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6. *Lecane pumila* (Rousselet, 1906)
Figure 79-82

Rousselet *in*: Murray 1906 p. 183 plate 6 fig. 25 (*Notommata pumila*); Hauer 1936a p. 154-157 figs 1-3 (*Lecane pumila*); Hauer 1938 p. 522 figs 45a-b, Kutikova 1970 p. 451 fig. 604; Koste 1978 p. 221 plate 73 figs 6a-f; Koste & Shiel 1990 p. 31 plate 13 fig. 6.

Differential diagnosis
L. pumila's relatively large, soft lorica and short, curved toes bearing pseudoclaws distinguish the species from all other soft-bodied *Lecane*.

Description
Illoricate *Lecane*. Lorica, though soft, of relatively constant shape when contracted: wider than long, with distinct head region. Foot pseudosegment not projecting, relatively broad, coxal plates inconspicuous. Prepedal fold narrow, elongate, distally with median projection. Toes short, curved, bearing distinct pseudoclaws.

Measurements: Total l. 75-170, DPl. 60-75, DPw. 90-140, VPl. 80-110, toe l. 9-10, claw l. 3-5.

Distribution
Probably cosmopolitan.

7. *Lecane boorali* Koste & Shiel, 1983
Figs 86-87

Koste & Shiel *in* Koste, Shiel & Brock 1983 p. 14-15, figs 7-8; Koste & Shiel, 1990 p. 19 plate 8 fig. 3.

Type locality and types
Roadside pool 15 km. south of Meekatharra, W. Australia. Holotype in collection of W. Koste, paratype in SAM.

Differential diagnosis
'distinguished ... through the construction of the lower ventral lorica, particularly through the hitherto singular configuration of the foot-joint region. The extended foot plate and tips also are distinctive.' (Koste *et al.*, 1983).

←
Figs 64-65: L. calcarea. 64: ventral view, 65: dorsal view.
Figs 66-67: L. niothis. 66: ventral view, 67: dorsal view.
Figs 68-69: L. rhacois. 68: dorsal view, 69: ventral view, extended.
Figs 70-73: L. clara. 70, 73: ventral view, 71: dorsal view, 72: ventral view, extended.
Fig. 74: L. inquieta, dorsal view.
Fig. 75: L. tenua, dorsal view.
Figs 76-78: L. palinacis. 76, 78: ventral view, 77: dorsal view.
(64-71, 76, 77: after Harring & Myers, 1926; 72: Madagascar (Segers, 1992); 73: 'Ronde Put', Postel, Belgium; 74, 75: after Myers, 1936a; 78: after Segers, 1991b).

Description
'Head aperture margins not coincident, dorsal straight, ventral concave, occasionally with median V-shaped groove; no cusps at external angles; dorsal plate narrower, shorter than ventral; characteristic triangular depressed foot cavity bounded by raised cuticular ridge; elongated foot plate deposed from body; toes with laterally opposed claws.' (Koste & Shiel, 1990).

Measurements: DPl. 180, DPw. 120, VPl. 200, VPw. 132, toe l. 82, claw l. 10.

Distribution
A single record from the type locality only.

8. *Lecane inermis* (Bryce, 1892)
Figure 84

Synonyms: *L. amorpha* Harring, 1914
L. supinoi Manfredi, 1929

L. althausi after Sarma (1988)

Bryce 1892 p. 274 text fig. (*Distyla inermis*); Murray 1913c p. 556-557 plate 22 figs 7a, b (*Cathypna inermis*); Harring 1913a p. 61 (*Lecane inermis*); Harring 1914 p. 544 plate 23 figs 1, 2 (*L. amorpha*); Harring & Myers 1926 p. 379-380 plate 33 figs 1, 2; Manfredi 1929 p. 3-5 fig. 1 (*L. supinoi*); Kutikova 1970 p. 451 fig. 606; Koste 1978 p. 219 plate 72 figs 14a-c, plate 73 figs 1a-h; Koste & Shiel 1990 p. 25 plate 11 fig. 3.

Differential diagnosis
L. inermis can be confused with *L. elongata* or *L. tenuiseta* but, unlike these species, its lorica is soft and flexible without a distinct ventral or dorsal plate.

Description
Lorica soft, elongate, shape inconsistent. Dorsal and ventral plates indistinguishable. Head aperture margin variable, mostly convex or irregular. Foot plate narrow, coxal plates indistinct. Foot pseudosegment not or slightly projecting, elongate. Prepedal fold narrow, elongate, distally with median projection. Toes parallel-sided, bearing long, completely separated, flexible claws.

Measurements: Tot. l. 92-154, DPl. 52-80, DPw. 36-48, VPl. 80-96, VPw. 48, Toe l. 14-16, claw l. 10-12.

Distribution
Cosmopolitan. *L. inermis* is a common, eurytopic species. It occurs frequently in the psammon of fresh or saline lakes, and of marine beaches.

9. *Lecane elegans* Harring, 1914
Figure 83

Harring 1914 p. 544-545 plate 23 figs 3, 4; Harring & Myers 1926 p. 371 plate 15 figs 1, 2; Koste 1978 p. 219 plate 72 figs 13a-d.

Type locality
Rio Grande reservoir, Panama.

Differential diagnosis
The species is readily distinguished by the unique shape of its toes and by its soft, elongate lorica.

Description
Lorica soft, smooth. Body elongate, slender, shape inconsistent. Head aperture margin ventrally straight, dorsally mostly deformed. Lateral sulci barely indicated. Ventral lorica with longitudinal folds. Foot plate large, prominent, without coxal plates. Foot pseudosegment elongate, parallel-sided, projecting. Toes long, parallel-sided, slightly recurved distally. Pseudoclaws long, curved, with large accessory claws.
Measurements: Tot. l. 170, body l. 108, body w. 45, toe l. 36, claw 15.

Distribution
Uncommon. The species occurs in tropical and subtropical waters.

10. *Lecane margalefi* De Manuel, 1994
Figure 85

Lecane sp. after De Manuel *et al.* (1992)

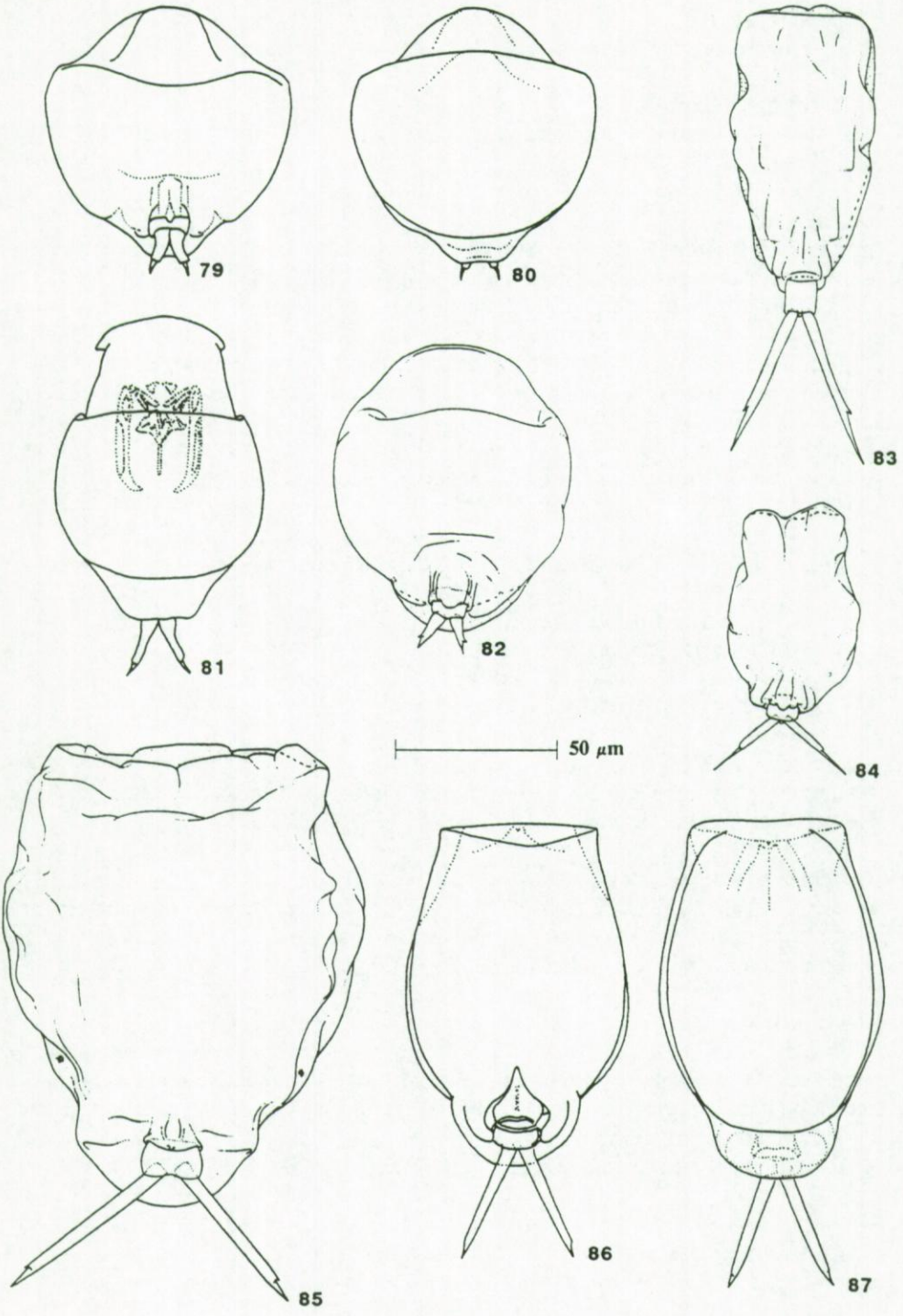
De Manuel 1994 p. 101-103, figs 3a-e.

Type locality and types
Santany; Ca's Frares and Sa Torre pond in Marina de Llucmajor, Majorca, Spain. Holotype and paratypes in MNCNM, paratypes in MZB and RUG.

Differential diagnosis
In size and general shape, *L. margalefi* resembles most *L. boorali*. It is characterised by its long, parallel-sided toes bearing distinct pseudoclaws and accessory claws, characters not seen in any other illoricate *Lecane*.

Description
Illoricate *Lecane*. Lorica shape variable, slightly longer than wide when contracted. No coxal plates. Prepedal fold broad, posterior margin rounded. Foot pseudosegment rectangular, not projecting. Toes elongate, parallel-sided, bearing distinct pseudoclaws and accessory claws.
Measurements: Lo l. 134-178, Lo w. 94-125, toe l. 50-64, claw l. 7-10.

Distribution
Known from several localities on Majorca, Spain.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11. *Lecane venusta* Harring & Myers, 1926
Figs 88-89

Harring & Myers 1926 p. 368 plate 27 figs 5, 6; Kutikova 1970 p. 460 fig. 634; Koste 1978 p. 217-218 text fig. 47a, plate 68 figs 14a-c; Koste & Shiel 1990 p. 34 plate 16 fig. 3.

Type locality
Ottoman Lake, near Waupaca, Wisconsin, U.S.A.

Differential diagnosis
L. venusta can, by its nearly straight head aperture margins, angulate antero-lateral corners, ornamented lorica and parallel-sided toes without claws, not be confused with any other *Lecane*.

Description
Lorica stiff. Dorsal plate anteriorly narrower, medially slightly wider than ventral plate, ornamented. Head aperture margin dorsally slightly convex, ventrally slightly concave. Ventral plate slightly longer than wide, with incomplete transverse and longitudinal folds, ornamented. Lateral margins straight, smooth, nearly parallel. Foot plate distinctly separated, coxal plates rounded triangular. Prepedal fold narrow, elongate, distally with median projection. Foot pseudosegment simple, projecting. Two parallel-sided toes, incurvate to sharp points distally. No claws.
Measurements: DPl. 86, DPw. 75, VPl. 84, VPw. 70, toe l. 42.

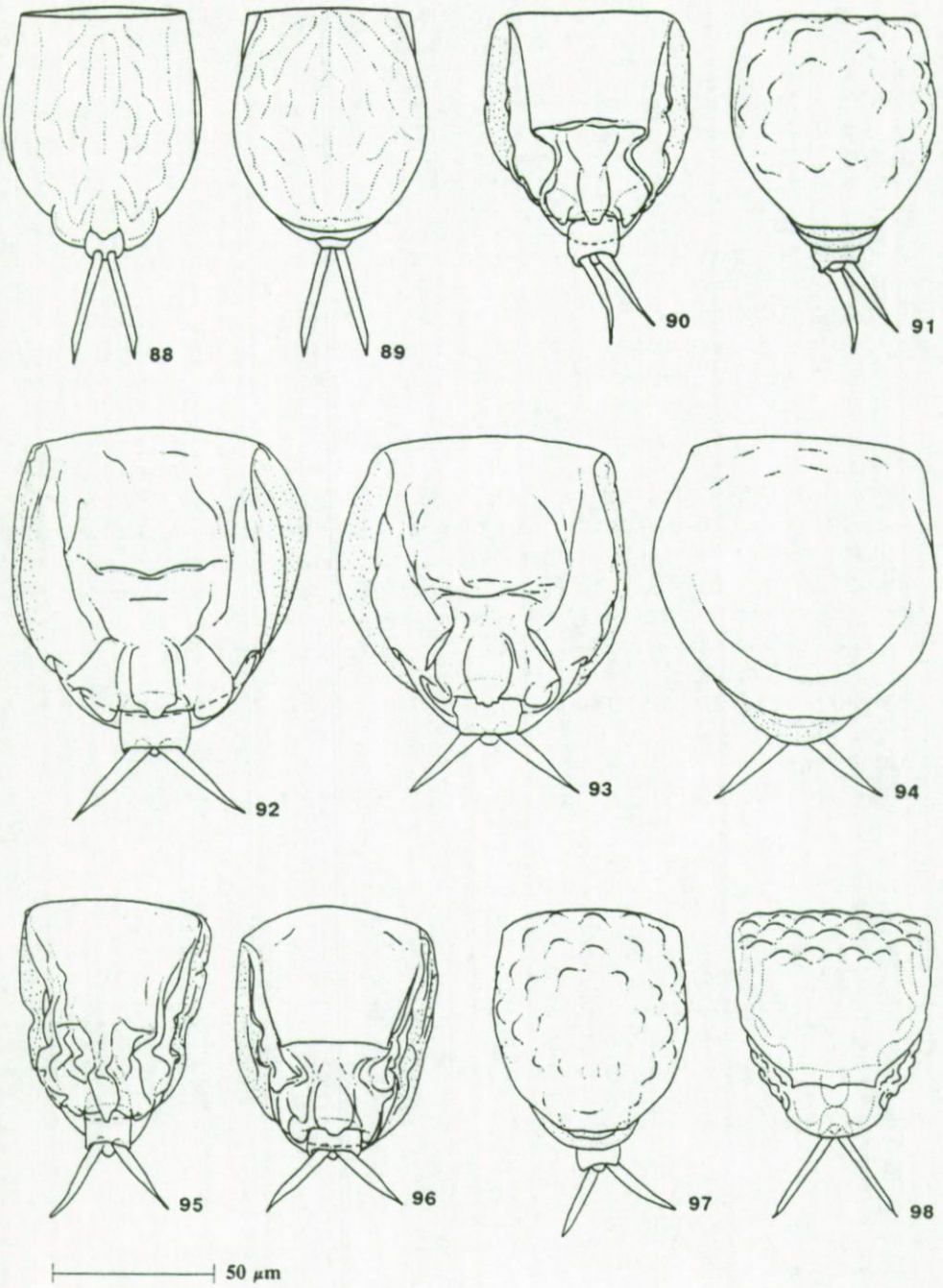
Distribution
Single record from the U.S.A., unconfirmed records from Uzbekistan and Australia.

12. *Lecane hornemanni* (Ehrenberg, 1834)
Figs 43-45, 90-97

Synonyms: *L. nodosa* Hauer, 1938
L. ceylonensis Chengalath & Fernando, 1973
L. camptica Bērziņš, 1982b
L. lamiranoensis Bērziņš, 1982b

non *L. hornemanni* after Wang (1961)

←
Figs 79-82: L. pumila. 79, 82: ventral view, 80: dorsal view, 81: ditto, extended.
Fig. 83: L. elegans, ventral view.
Fig. 84: L. inermis, ventral view.
Fig. 85: L. margalefi, ventral view.
Figs 86-87: L. boorali. 86: ventral view, 87: dorsal view.
(79-81: after Hauer, 1936a; 82: 'Pyr. Orient.', France, leg. & det. W. De Smet; 83: Rio Abobral, Pantanal region, Brazil; 84: Easter Island (Segers & Dumont, 1993a); 85: *L. margalefi*, paratype (see De Manuel, 1994); 86-87: after Koste *et al.*, 1983).



Figs 88-89: L. venusta. 88: ventral view, 89: dorsal view.
Figs 90-97: L. hornemanni. 90, 92, 93, 95-96: ventral view, 91, 94, 97: dorsal view.
Fig. 98: L. pustulosa, dorsal view.
(88-89 after Harring & Myers, 1926; 90: Rio Abobral, Pantanal region, Brazil; 91-95, 97: after Segers, 1992; 96: Oman (Segers & Dumont, 1993b); 98: after Myers, 1938).

Ehrenberg 1834 p. 206, 220 (*Euchlanis hornemanni*); Hudson & Gosse 1886 p. 42 plate 33 fig. 37 (*Distyla hornemanni*); Murray 1913a p. 349-350 plate 14 figs 26a-d (*Cathypna hornemanni*); Harring 1914 p. 543 (*Lecane hornemanni*); Harring & Myers 1926 p. 377-378 plate 34 figs 3, 4; Hauer 1938 p. 520-521 figs 42a, b (*L. nodosa*); Wulfert 1966 p. 74 fig. 33; p. 75 fig. 27a-d (*L. nodosa*); Kutikova 1970 p. 458-459 fig. 629; Chengalath & Fernando 1973 p. 15 figs 1, 2 (*L. ceylonensis*); Koste 1978 p. 204 plate 68 figs 5a, b, 6a, b, 9a-c; figs 7a-d (*L. nodosa*); De Ridder 1981 p. 78-79 plate 4 fig. 12 (*L. nodosa*); Bērziņš 1982b p. 10 fig. 10 (*L. camptica*); p. 14 figs 12, 28 (*L. lamiranoensis*); Brandorff *et al.* 1982 p. 85-86 figs 32-33 (*L. nodosa*); Koste & Shiel 1990 p. 23-25 plate 11 fig. 5; p. 29 plate 13 fig. 1 (*L. nodosa*); Segers 1992 p. 357-358 figs 5a-g.

Differential diagnosis

L. hornemanni can hardly be confused with any other *Lecane*. Its relatively short toes with asymmetric tips and its lorica without lateral sulci distinguish the species from *L. nelsoni*. *L. latissima* and *L. abanica* have toes bearing incompletely separated claws.

Description

Lorica relatively soft, easily deformed. Dorsal plate wider than ventral plate, smooth or ornamented with knobby hemispheres. Head aperture margins nearly coincident, straight or slightly convex, with rounded antero-lateral corners. Ventral plate slightly longer than wide, with incomplete transverse and longitudinal folds, occasionally ornamented. Lateral sulci absent. Foot plate broad, coxal plates rounded. Prepedal fold relatively broad, elongate, distally with median projection. Foot pseudosegment rectangular, not or distinctly projecting. Toes flexible, parallel-sided then incurvate. Toe tips asymmetrical, no claws.

Measurements: DPl. 60-110, DPw. (48)57-110, VPl. 64-115, VPw. (48)51-110, anterior edge w. 51-90, toe l. 23-35.

Distribution

Cosmopolitan, more frequent in subtropics and tropics.

Comments

The lorica of *L. hornemanni* is relatively soft and easily deformed. Several of such imperfectly contracted specimens have been described as separate species (see Segers, 1992).

Note

L. pustulosa Myers, 1938 (fig. 98), described from the hygropsammon of Lenape Lake, New Jersey, U.S.A., differs from *L. hornemanni* only by its relatively longer and more slender toes. Its status as a valid species is uncertain.

Measurements: DPl. 38, VPl. 52, anterior edge w. 45, toe l. 23.

13. *Lecane tryphema* Harring & Myers, 1926
Figure 99

Harring & Myers 1926 p. 376 plate 34 figs 5, 6; Hauer 1929 p. 150-151 figs 7a, b; Kutikova 1970 p. 460 fig. 632; Koste 1978 p. 204 plate 68 figs 3a, b.

Type locality and type
Mather, Wisconsin; Atlantic City, New Jersey; Mount Desert Island, Maine, U.S.A. Paratype in PANS.

Differential diagnosis
L. tryphema is characterised by the shape of its toes and of its head aperture. It can be confused with *L. nana*, which has characteristic toe tips. *L. tryphema* has a relatively broader lorica than *L. nana*.

Description
Lorica stiff. Dorsal plate anteriorly as wide as, medially wider than ventral plate, smooth. Head aperture margin dorsally nearly straight, with a pair of sublateral notches, ventrally more or less concave. Antero-lateral corners angulate. Ventral plate longer than wide, smooth. Transverse fold incomplete. Lateral margins smooth, curved, with smooth anterior notches. Lateral sulci deep. Foot plate broad, rounded posteriorly, coxal plates rounded triangular. Prepedal fold rather broad, elongate, distal margin with median projection. Foot pseudosegment simple, not projecting. Toes parallel-sided, incurvate distally, no claws.

Measurements: DPl. 69-78, DPw. 70-81, VPl. 78-91, VPw. 66-78, anterior edge w. 53-62, toe l. 17-29.

Distribution
So far recorded from the Northern temperate zone only. The species lives between submerged mosses in acid waters.

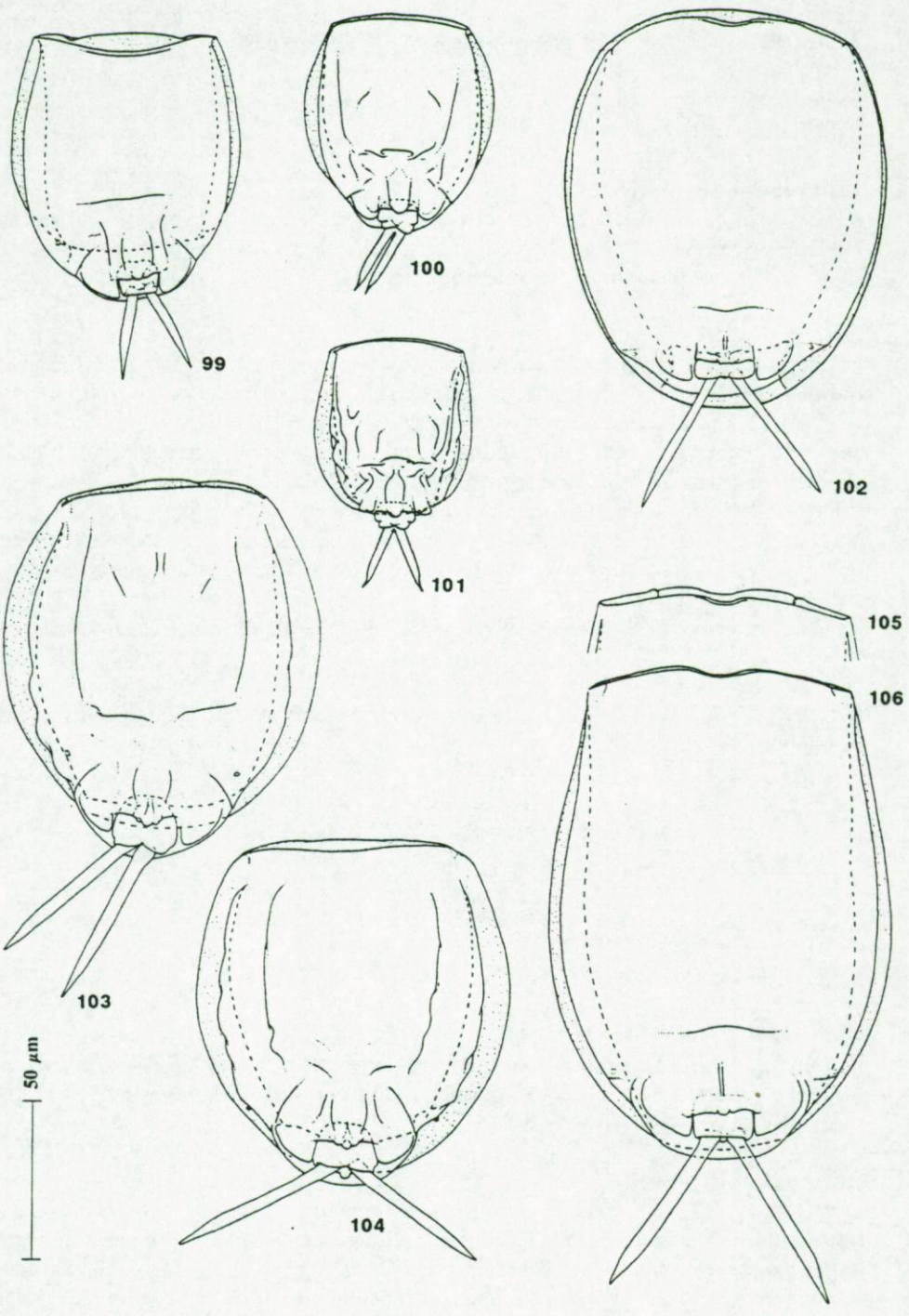
14. *Lecane nana* (Murray, 1913a)
Figs 100-101, 319

Infrasubspecific taxon: var. *monostyla* Rodewald, 1940

Murray 1913a p. 353 plate 14 figs 29a-c (*Cathypna nana*); Harring 1914 p. 536 (*Lecane nana*); Hauer 1925 p. 168 fig. 8; Harring & Myers 1926 p. 375-376 plate 34 figs 1, 2; Rodewald 1940 p. 277 fig. 4; Kutikova 1970 p. 460 fig. 631 (incl. *L. nana*

→

Fig. 99: L. tryphema, ventral view.
Figs 100-101: L. nana, ventral view (see also fig. 319).
Fig. 102: L. remanei, ventral view.
Figs 103-104: L. nelsoni, ventral view.
Figs 105-106: L. melini, ventral view; 106: head aperture.
(99: 'Hageven', Neerpelt, Belgium; 100-101: Saudi Arabia (Segers & Dumont, 1993b.); 102: Rio Jatapú, Amazon region, Brazil; 103-104: after Segers, 1994; 105-106: Cristallino Lake, Brazil).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monostyla); Koste 1978 p. 204-205 plate 68 figs 10a-d, plate 78 figs 4, 9; Koste & Shiel 1990 p. 27 plate 12 fig. 6.

Type locality
Lake Titicaca at Guaqui, Bolivia.

Differential diagnosis
L. nana can be confused with *L. paxiana*, but lacks the latter species' clawed toes. From *L. tryphema*, *L. nana* differs by its generally smaller size and by the peculiar shape of its toe tips, which are outcurved distally.

Description
Lorica stiff. Dorsal plate anteriorly nearly as wide as, and medially wider than ventral plate, smooth. Head aperture margins nearly coincident, parallel or slightly convex, antero-lateral corners angulate. Ventral plate slightly longer than wide, with incomplete transverse and longitudinal folds, occasionally irregularly folded or slightly ornamented. Lateral margins irregularly folded, nearly parallel. Lateral sulci shallow. Prepedal fold narrow, elongate, posteriorly with median projection. Foot plate broad, rounded posteriorly, coxal plates rounded. Foot pseudosegment simple, not or slightly projecting. Toes occasionally fused basally, tips characteristically curved, no claws.

Measurements: DPl. 45-64, DPw. 44-62, VPl. 52-68, VPw. 47-52, toe l. 20-30.

Distribution
L. nana is cosmopolitan, but is more frequent in warm waters. The species tolerates saline conditions.

15. *Lecane nelsoni* Segers, 1994
Figs 40-42, 103-104

Lecane sp. after Segers *et al.* (1993a)?

Segers 1994 p. 247-249 figs 4a-e.

Type locality and types
Temporary inundation pond of the Rio Mucajaí, (a tributary of Rio Branca), near Mucajaí, Roraima, Brazil. Holotype and paratype in INPA, paratype in KBIN, paratypes in RUG.

Differential diagnosis
L. nelsoni is close to *L. hornemanni*, *L. latissima* and *L. ruttneri*. In contrast to the two last-mentioned species, *L. nelsoni* has toes without claws. The species differs from *L. hornemanni* by following characters: (1) lateral sulci are nearly absent in *L. hornemanni*, distinctly present in *L. nelsoni*; (2) the toes of *L. hornemanni* are shorter than those of *L. nelsoni* and (3) the toe tips of *L. hornemanni* are asymmetrical, those of *L. nelsoni* are symmetrical. The species is distinguished from *L. remanei* by its straight head aperture margins, and softer lorica.

Description
Lorica stiff. Dorsal plate wider than ventral plate, smooth. Head aperture margins nearly coincident, more or less straight or lightly convex, with rounded antero-lateral corners. Ventral plate slightly longer than wide, with weak, incomplete transverse and longitudinal folds, smooth. Lateral margins of ventral plate curved, irregularly undulate, not reaching the head aperture. Lateral sulci present, more pronounced posteriorly. Foot plate broad, coxal plates rounded triangular. Prepedal fold narrow, elongate, with median projection. Foot pseudosegment rectangular, not projecting. Toes long, parallel-sided, smoothly tapering distally. No claws.

Measurements: DPl. 92-107, DPw. 98-100, VPl. 101-109, VPw. 75-82, toe l. 51-58.

Distribution
The species is recorded from three localities near Boa Vista, Roraima, Brazil. A specimen, closely resembling *L. nelsoni* was recorded from Nigeria (Segers *et al.*, 1993a).

16. *Lecane remanei* Hauer, 1964
Figure 102

Hauer 1964 p. 28-30 figs 1a-d; Hauer 1965b p. 365-366 figs 21a-d; Koste 1972 p. 394-395 plate 29 fig. 4; Koste 1978 p. 221 plate 73 figs 8a-d.

Type locality
Arapun, Rio Negro near Manaus, Brazil.

Differential diagnosis
L. remanei is characterised by its nearly round lorica, broad foot pseudosegment, and long, parallel-sided toes without claws. The species resembles most *L. melini*, but has a distinctly less elongate lorica. It can be distinguished from *L. nelsoni* by its generally convex head aperture margins, and by the median sinus on its ventral head aperture margin.

Description
Lorica stiff. Dorsal plate more or less as wide as ventral plate, rounded and smooth. Head aperture margins almost coincident, distinctly convex, ventrally with shallow median sinus. Antero-lateral corners rounded. Ventral plate slightly longer than wide, transverse fold incomplete. Lateral margins smooth, curved. Lateral sulci deep. Foot plate broad with rounded triangular coxal plates. Prepedal fold broad, distally with median projection. Foot pseudosegment not projecting, rectangular. Toes parallel-sided, no claws.

Measurements: DPl. 120-128, DPw. 100-110, VPl. 118-126, VPw. 97-100, toe l. 54-59.

Distribution
L. remanei is a rare endemic of the Amazon region, Brazil.

Comments
In contrast to the description by Hauer (1964), no claws could be observed in our material. This confirms the observation by Koste (1972). The mention of this character by Hauer (1964, 1965b) probably follows from a misinterpretation of curved toe tips in his material.

17. *Lecane melini* Thomasson, 1953
Figs 105-106

Thomasson 1953 p. 191 figs 3a, b; Hauer 1965b p. 361 figs 18a-c; Koste 1978 p. 206 plate 68 figs 15a-c.

Type locality
Rio Negro near Manaus, Brazil.

Differential diagnosis
L. melini can, by its broadly bilobate ventral and dorsal head aperture margins, and its characteristic elongate lorica, hardly be confused with any other *Lecane*. It appears related to species such as *L. remanei* and *L. rudescui*, but can hardly be mistaken for those.

Description
Lorica stiff. Dorsal plate slightly wider than ventral plate, reticulate. Head aperture margins almost coincident, broadly bilobate, antero-lateral corners angulate. Ventral plate elongate, transverse fold incomplete. Lateral margins smooth, straight, nearly parallel. Lateral sulci deep. Foot plate broad with rounded triangular coxal plates. Prepedal fold broad, posteriorly with median projection. Foot pseudosegment not projecting, squarish. Toes relatively long, parallel-sided with short sharp point, no claws.

Measurements: DPl. 133-148, DPw. 89-102, VPl. 135-151, VPw. 87-100, toe l. 56-64.

Distribution
L. melini is endemic to the Amazon region, where it is rather common.

18. *Lecane rudescui* Hauer, 1965a
Figure 107

Hauer 1965a p. 42-43 figs 2a-b; Hauer 1965b p. 384-385 figs 37a-c; Koste 1978 p. 235 plate 69 figs 15a-b; Koste *et al.*, 1984 p. 565 fig. 8.

Type locality
Tarumao, Amazon region, Brazil.

Differential diagnosis
L. rudescui is reminiscent of *L. donneri*, they differ by their different head aperture.

L. rudescui also resembles species such as *L. ordwayi* and *L. herzigi*, but these have a non-projecting foot pseudosegment.

Description
Lorica stiff. Dorsal plate wider than ventral plate, smooth. Head aperture margins almost coincident, concave with median sinus and large antero-lateral spines. Ventral plate with incomplete transverse fold, smooth. Lateral margins smooth, slightly curved, not reaching the head aperture. Foot plate relatively narrow, slightly elongate. Prepedal fold broad, distal margin with median projection. Foot pseudosegment projecting, slightly narrower in distal half. Toes parallel-sided, tapering to point distally, no claws.

Measurements: DPl. 114-130, DPw. 86-90, VPl. 112-125, VPw. 84-87, toe l. 41-48.

Distribution
The species is a rare endemic of the Amazon region, Brazil.

Comments
The present description deviates from those by Hauer (1965a, b) and Koste *et al.* (1984). Here, the species is reported to have a consistently wider dorsal than ventral plate, whereas previous descriptions figure the dorsal plate as being anteriorly narrower, medially wider than the ventral plate. The general shape of lorica, foot and toes is, otherwise, equivocal. Taking into account that previous authors did not mention the relative width of the dorsal versus the ventral plate as a taxonomically relevant character, that measurements by Koste *et al.* (1984) seem to contradict his figure, and that this is not the only case in which the character is misinterpreted (e.g. see Koste, 1972: plate 28 fig. 2a; plate 31 fig. 3), I identify the specimens on which the present diagnosis is based, as *L. rudescui*.

As described here, *L. rudescui* is closely related to species such as *L. deridderae*, *L. melini*, *L. remanei* and *L. nelsoni*, all of which have a consistently wider dorsal than ventral plate, a more or less similar foot pseudosegment shape, deep lateral sulci and parallel-sided toes without claws or pseudoclaws. All these species are neotropical. Their closest, non-endemic relatives are *L. pertica* and *L. signifera*.

19. *Lecane pertica* Harring & Myers, 1926
Figs 6, 20, 113-114

Harring & Myers 1926 p. 340-341 plate 12 figs 1, 2; Hauer 1938 p. 521 figs 43a, b; Koste 1978 p. 208 plate 69 figs 10a, b, 14a-c; Koste & Shiel 1990 p. 29-30 plate 13 fig. 5.

Type locality and type
Oneida and Vilas Counties, Wisconsin; Polk County, Florida; Mount Desert Island, Maine; Atlantic city, New Jersey, U.S.A. Paratype in PANS.

Differential diagnosis
L. pertica can hardly be confused with any other *Lecane*. By the structure of the anterior part of the lorica, it is close to *L. signifera*, but its projecting, parallel-sided foot pseudosegment distinguishes the species. *L. pertica* differs form the closely related *L. deridderae* by having a different anterior region, an ornamented lorica and by being larger.

Description
Loricate *Lecane*. Dorsal plate wider than ventral plate, ornamented. Head aperture margins coincident, straight or nearly so. Antero-lateral spines, formed by ventral and dorsal plate, present. Ventral plate elongate, with incomplete transverse and longitudinal folds, ornamented. Lateral margins smooth, curved, with smooth antero-lateral notches. Lateral sulci deep, more pronounced posteriorly. Foot plate broad, rounded posteriorly, coxal plates rounded triangular. Prepedal fold narrow, posterior margin with median projection. Foot pseudosegment rectangular, parallel-sided, projecting. Toes long, parallel-sided, tapering to point, no claws.

Measurements: DPl. 97-140, DPw. 66-100, VPl. 115-160, VPw. 60-88, toe l. 60-85.

Distribution
Pantropical and Pansubtropical in acid waters, rather common.

20. *Lecane deridderae* Koste, 1972
Figure 112

Koste 1972 p. 385-386 plate 29 fig. 1 (*L. deridderi*); Koste 1978 p. 208 plate 69 fig. 13 (*L. deridderi*); Segers 1991a p. 77.

Type locality
Poço de Livramento, Três Casas; Lago Alter do Chão; Lago do Caxias; Rio Tapajós, Rio Cuparí, Brazil.

Differential diagnosis
L. deridderae can be confused with *L. pertica*. The species is smaller, has a smooth lorica and a more elongate foot pseudosegment. Its ventral head aperture margin has a shallow median notch, and the lateral sulci end before the anterior margin.

Description
Loricate *Lecane*. Dorsal plate wider than ventral plate, smooth. Head aperture margins nearly coincident, dorsally straight, ventrally with shallow, wide sinus. Antero-lateral spines, formed by ventral and dorsal plate, present. Ventral plate elongate, with incomplete transverse and longitudinal folds, smooth. Lateral margins smooth, curved. Deep lateral sulci, not reaching the head aperture. Foot plate broad, rounded or with sinus distally, coxal plates rounded triangular. Prepedal fold narrow, posterior margin with median projection. Foot pseudosegment elongate, parallel-sided, projecting. Toes long, parallel-sided, tapering to point. No claws.

Measurements: DPl. 86-100, DPw. 58-60, VPl. 95-106, VPw. 50-60, length of foot pseudosegment 16-17, toe l. 42-46.

Distribution
Endemic to the Amazon region, rare.

Comments
The status of this species, relative to *L. pertica*, needs confirmation.

21. *Lecane tabida* Harring & Myers, 1926
Figs 108-109

Harring & Myers 1926 p. 361 plate 26 figs 3, 4; Koste 1978 p. 208 plate 69 fig. 12a.

Type locality
Mount desert Island, Maine, U.S.A.

Differential diagnosis
The species resembles *L. rhytida* and *L. simonneae*. It is characterised by its slightly convex head aperture margins, its elongate, nearly parallel-sided ventral plate and its short, parallel-sided toes.

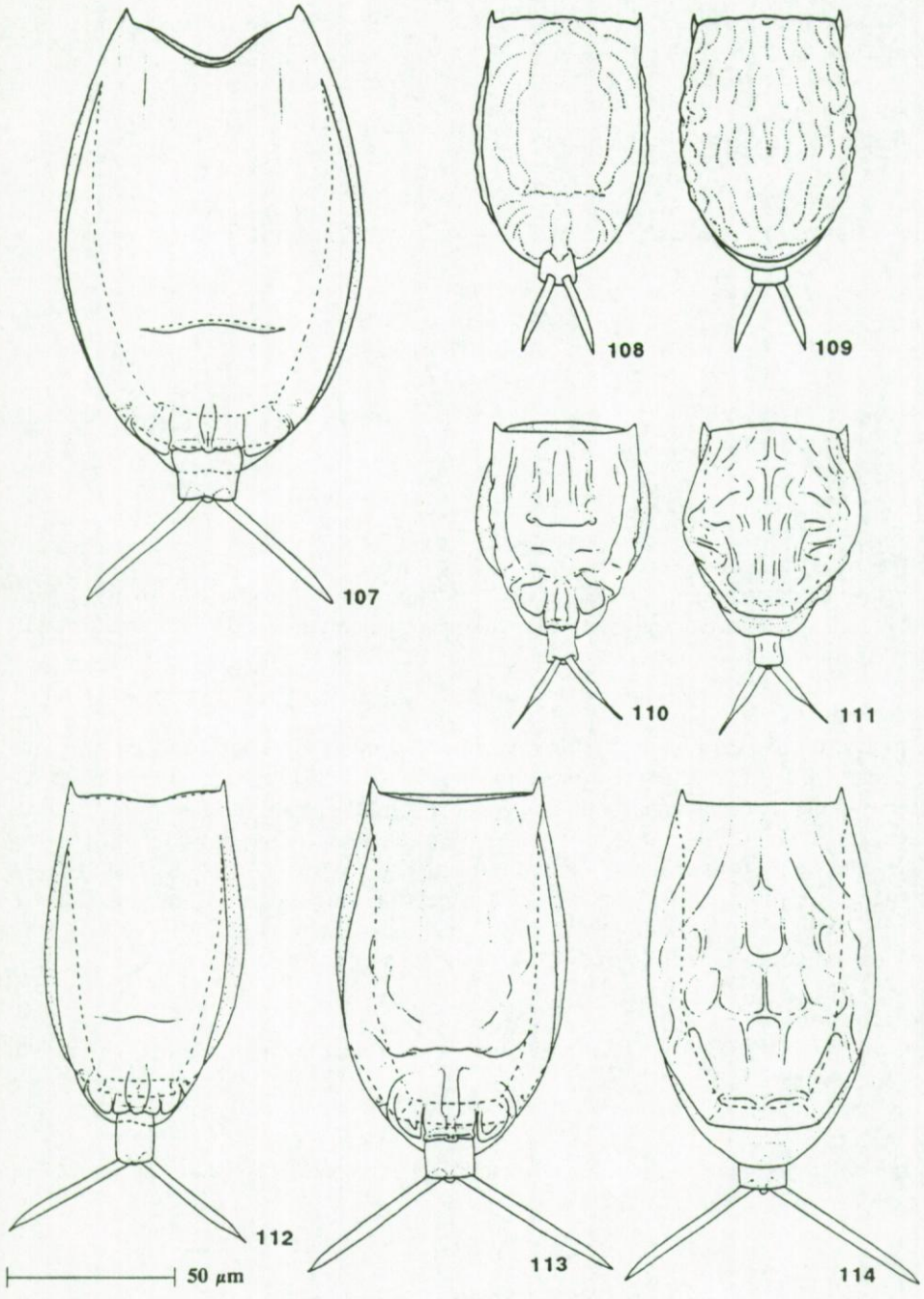
Description
Lorica stiff. Dorsal plate anteriorly narrower, medially wider than ventral plate, ornamented. Head aperture margins almost coincident, slightly convex, with antero-lateral spines. Ventral plate elongate, with incomplete transverse and longitudinal folds, ornamented. Lateral margins irregularly undulate, straight and parallel. Foot plate wide, with rounded coxal plates. Prepedal fold narrow, elongate, distally with median projection. Foot pseudosegment projecting, only slightly longer than wide, parallel-sided. Toes parallel-sided, short, incurvate distally, no claws.
Measurements: DPl. 94, DPw. 65, VPl. 98, VPw. 60, toe l. 30.

Distribution
Known from the U.S.A. and Sierra Leone. Several unconfirmed records from South America exist, e.g. Koste (1972).

Comments
L. tabida after Hauer (1965b) most probably concerns a misidentified specimen. The specimens' true identity is unclear.

22. *Lecane simonneae* Segers, 1993
Figs 119-121

Segers 1993 p. 55-56 figs 16a, b; Segers *et al.* 1994 p. 253 fig. 4


107
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50 µm

Type locality and types
Swamp in mouth of Awbana river, Oguta Lake, Imo State, Nigeria. Holotype and paratypes in MRAC, paratypes in RUG.

Differential diagnosis
The species closely resembles *L. rhytida*. It is characterised by its parallel-sided, elongate toes (tapering from midway onwards in *L. rhytida*), and by its robust foot pseudosegment. Generally, the species has a more elongate lorica than *L. rhytida*. It differs from *L. tabida* by its robust foot pseudosegment, bearing lateral extensions and by its relatively longer toes; from *L. pertica* by its different head aperture and foot pseudosegment. It appears related to the group of *L. eutarsa*, but cannot be confused with any of these by its clawless toes.

Description
Lorica stiff. Dorsal plate anteriorly narrower, medially wider than ventral plate, ornamented. Head aperture margins almost coincident, straight or slightly concave, with strong antero-lateral spines. Ventral plate elongate, with incomplete transverse and longitudinal folds, ornamented. Lateral margins smoothly curved or irregularly undulate. Lateral sulci deep. Foot plate wide, with rounded triangular coxal plates. Prepedal fold narrow, elongate, distally with median projection. Foot pseudosegment projecting, with lateral lobes. Toes parallel-sided, elongate, tapering to sharp point distally.

Measurements: DPl. 64-73, DPw. 56-59, VPl. 76-80, VPw. 46-53, toe l. 40-45.

Distribution
Recorded from Africa and India. The species may have been confused with *L. rhytida*.

23. *Lecane sola* Hauer, 1936b
Figs 110-111

non *L. sola* after Wulfert (1966)

Hauer 1936b p. 78-80 figs 3a, b; Koste 1978 p. 207 plate 68 figs 13a, b, plate 69 figs 9a-b; Koste 1988a p. 118 fig. 21; Koste 1990 p. 101 fig. 15.

Type locality
Almata lake, India.

←
Fig. 107: L. rudescui, ventral view.
Figs 108-109: L. tabida. 108: ventral view, 109: dorsal view.
Figs 110-111: L. sola. 110: ventral view, 111: dorsal view.
Fig. 112: L. deridderae, ventral view.
Figs 113-114: L. pertica. 113: ventral view, 114: dorsal view.
(107: Rio Jatapú, Amazonas, Brazil; 108-109: after Harring & Myers, 1926; 110-111: Rio Abobral, Pantanal region, Brazil; 112: Lago Jacundá, Rio Tapajós, Pará, Brazil; 113-114: Nigeria (Segers *et al.*, 1993a)).

Differential diagnosis
The species superficially resembles *L. rhytida* and *L. simonneae*. It is diagnosed by its relatively short ventral plate, with nearly parallel lateral margins; its nearly straight or slightly convex head aperture margins; its toes tapering from medially onwards and, especially, the medially constricted foot pseudosegment.

The species can also be confused with *L. doryssa*, from which it differs by the presence of antero-lateral spines and by its medially constricted foot pseudosegment, and by its toes without claws.

Description
Lorica stiff. Dorsal plate anteriorly narrower, medially wider than ventral plate, ornamented. Head aperture margins almost coincident, nearly straight or convex, with antero-lateral spines. Ventral plate slightly longer than wide, with incomplete transverse and longitudinal folds, ornamented. Lateral margins irregularly undulate, nearly straight. Lateral sulci deep. Foot plate wide, with rounded triangular coxal plates. Prepedal fold narrow, elongate, distally with median projection. Foot pseudosegment projecting, with median constriction. Toes parallel-sided to medially then tapering to sharp point.

Measurements: DPl. 60, DPw. 62, VPl. 71, VPw. 55, ant. edge w. 46, toe l. 26.

Distribution
Insufficiently known. Records are from Birma (Koste, 1990), Borneo (Koste, 1988a) and India (Hauer, 1936b). The species has also been recorded from South America (Ecuador: Koste & Böttger, 1989; Brazil).

24. *Lecane rhytida* Harring & Myers, 1926
Figs 116-118

non *L. rhytida* after Hauer (1965b), Koste (1972), De Ridder (1981)

Harring & Myers 1926 p. 346-347 plate 20 figs 3, 4; Koste 1978 p. 207-208 plate 69 fig. 11; Koste & Shiel 1990 p. 31 plate 14 fig. 3; Segers *et al.* 1993a p. 69; Segers *et al.* 1994 fig. 5.

Type locality
Atlantic City, New Jersey; Mount Desert Island, Maine, U.S.A.

Differential diagnosis
L. rhytida needs careful comparison with *L. donneri*, *L. lauterborni* and *L. simonneae*. The species is characterised by the shape of its projecting foot pseudosegment, having lateral extensions (non-projecting in *L. lauterborni*, no lateral extensions in *L. lauterborni* and *L. donneri*, more elongate and robust in *L. simonneae*), and by the shape of its toes, tapering form midway onwards (parallel-sided up to the tip in *L. simonneae*). Its toes are mostly shorter than those of *L. simonneae*.

Description
Lorica stiff. Dorsal plate anteriorly narrower, medially wider than ventral plate, ornamented. Head aperture margins nearly coincident or parallel, slightly concave, with antero-lateral spines. Ventral plate longer than wide to elongate, with incomplete transverse and longitudinal folds, ornamented. Lateral margins smooth, curved or irregularly folded. Lateral sulci deep. Foot plate broad, coxal plates rounded triangular. Prepedal fold narrow, elongate, distally with median projection. Foot pseudosegment projecting, with mediolateral extensions. Toes parallel-sided to medially, then tapering to sharp point. No claws.

Measurements: DPl. 75-84, DPw. 66-69, VPl. 80-100, VPw. 59-65, toe l. 36-41.

Distribution
Not uncommon in Central and South America (Brazil, Nicaragua, U.S.A.), confirmed Old World records are from Nigeria and Papua New Guinea.

25. *Lecane donneri* Chengalath & Mulamoottil, 1974
Figure 115

L. lauterborni after ?Koste (1988a), Segers (1992), Segers & Dumont (1993b)

Chengalath & Mulamoottil 1974 p. 948 figs 7, 8.

Type locality and types
Pinehurst Lake, Canada. Holotype and paratypes in collection of Dept. of Biology, University of Waterloo, Waterloo, Ontario, Canada.

Differential diagnosis
The species is distinguished from *L. lauterborni* by its projecting foot pseudosegment and from *L. rhytida* and *L. simonneae* by its rather straight head aperture margins, its smooth lorica and by the absence of lateral lobes on the foot pseudosegment.

Description
Lorica stiff. Dorsal plate medially wider than ventral plate, smooth. Head aperture margins coincident, straight, with antero-lateral spines. Ventral plate longer than wide, with incomplete transverse and longitudinal folds. Lateral margins smooth, slightly curved, with anterior notches. Lateral sulci deep. Foot plate broad, with rounded triangular coxal plates. Prepedal fold narrow, elongate, posterior margin with median projection. Foot pseudosegment projecting, widest in distal half. Toes smoothly tapering to sharp point. No claws.

Measurements: DPl. 76-80, DPw. 66-70, VPl. 81-87, VPw. 60-65, toe l. 36-43.

Distribution
Known from ?Borneo, Canada, Madagascar and Oman.

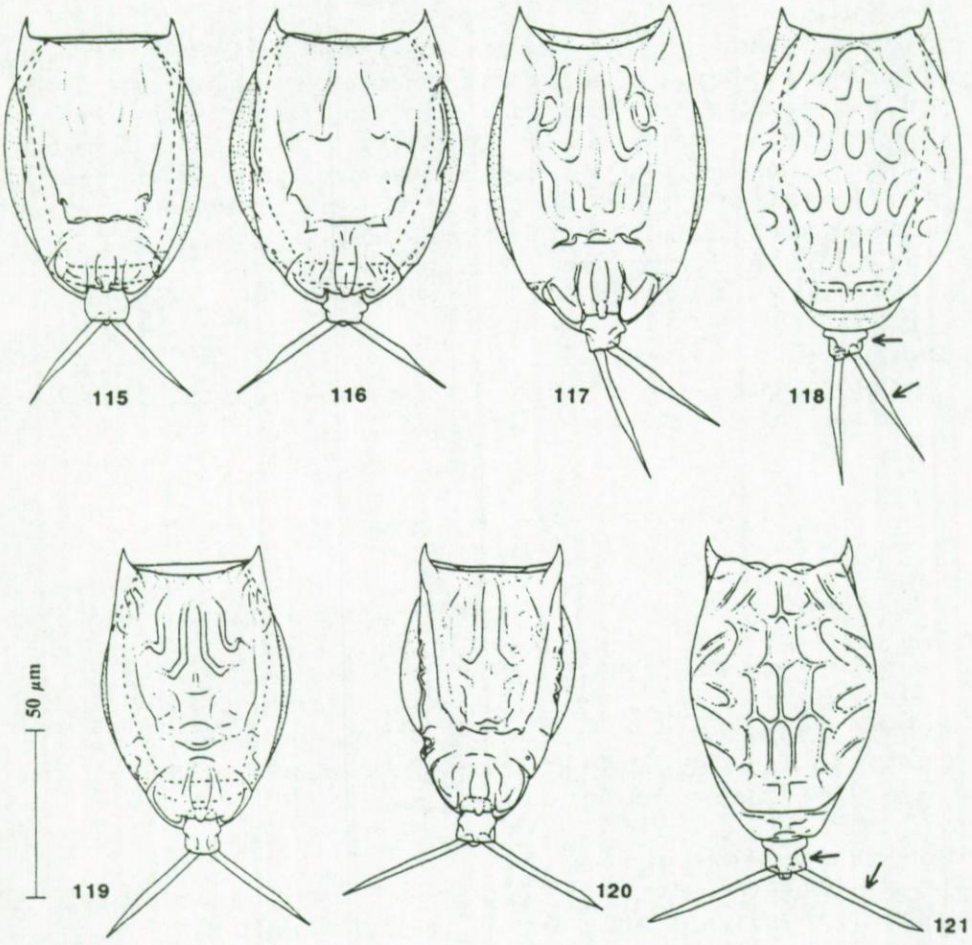


Fig. 115: *L. donneri*, ventral view.
Figs 116-118: *L. rhytida*. 116-117: ventral view, 118: dorsal view.
Figs. 119-121: *L. simonneae*. 119-120: ventral view, 121: dorsal view.
(115: Madagascar (Segers, 1992 (sub. *L. lauterborni*)); 116, 119: after Segers *et al.*, 1994; 117-118, 120-121: after Segers, 1993).

26. *Lecane signifera* (Jennings, 1896)
Figs 5, 25, 50-52, 122-126

Synonyms: *L. ploenensis* (Voigt, 1902) Harring, 1913a
L. aquila Harring & Myers, 1926
L. signifera glandulosa Sudzuki, 1991

L. levistyla after Koste (1972)

Jennings 1896 p. 92 figs 1, 2 (*Distyla signifera*); Voigt 1902 p. 679 (*Distyla ploenensis*); Myers 1913c p. 552 plate 22 figs 4a, b (*Cathypna ploenensis*); plate 23

figs 13a, b (*Cathypna signifera*); Harring 1913a p. 62 (*Lecane signifera*); Harring & Myers 1926 p. 332-333 plate 13 figs 5, 6 (*L. ploenensis*); p. 333-334 plate 13 figs 3, 4; p. 334 plate 13 figs 1, 2 (*L. aquila*); Wiszniewski 1954 p. 70 (incl. *L. signifera aquila*, *L. signifera ploenensis*); Kutikova 1970 p. 454 figs 613, 619 (incl. *L. signifera ploenensis*); Koste 1978 p. 209 plate 69 figs 1a, b, 2a-c (incl. var. *ploenensis*); p. 210 plate 69 figs 3, 5a-b (*L. aquila*); De Ridder 1981 p. 77 plate 4 fig. 10; Koste & Shiel 1990 p. 33 plate 14 fig. 6, plate 15 fig. 1 (incl. *L. signifera ploenensis*); Sudzuki 1991 p. 16 plate 12 fig. 2 (*L. signifera glandulosa*).

Differential diagnosis

L. signifera is close to *L. pertica* and *L. pyrrha*. The species differs from *L. pertica* by its non-projecting foot pseudosegment, from *L. pyrrha* by its different head aperture, stouter lorica and presence of distinct, smooth anterior notches on the lateral margins of the ventral plate.

Description

Loricate *Lecane*. Dorsal plate wider than ventral plate, ornamented. Head aperture margins coincident, straight or nearly so. Antero-lateral spines present, formed by ventral and dorsal plates. Ventral plate longer than wide, with incomplete transverse and longitudinal folds, ornamented. Lateral margins smooth, curved, with smooth notches anteriorly. Lateral sulci deep, more pronounced posteriorly. Foot plate broad, rounded posteriorly, coxal plates rounded triangular. Prepedal fold elongate, narrow, distally with median projection. Foot pseudosegment squarish, parallel-sided, not projecting. Toes long, parallel-sided, tapering to point, no claws.

Measurements: DPl. 80-190, DPw. 66-148, VPl. 90-202, VPw. 55-125, Toe l. 35-100.

Distribution

The species is cosmopolitan, but occurs more frequently in warmer waters.

Comments

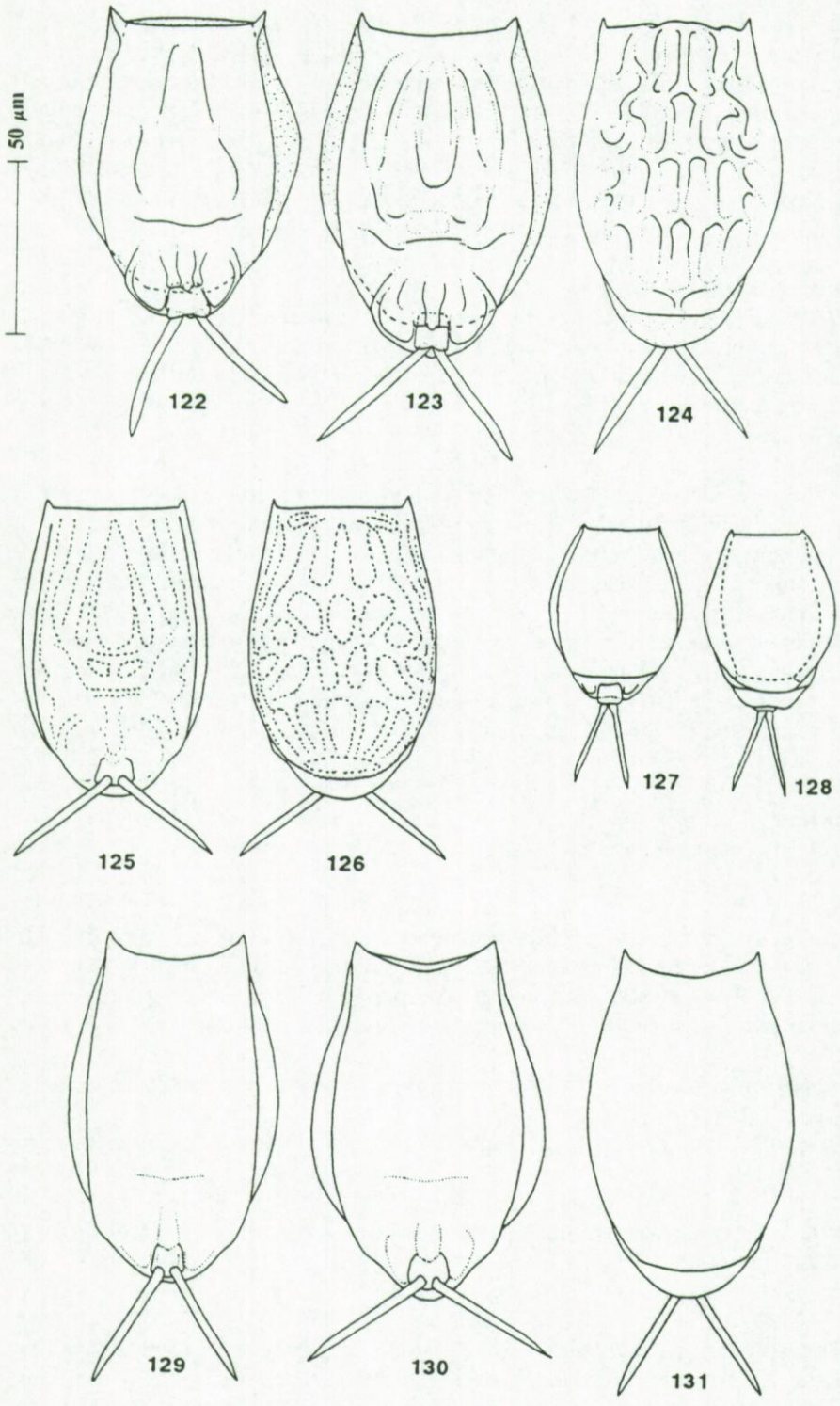
The intraspecific variability in lorica ornamentation is important in *L. signifera*. Ornamentations can be inconspicuous (fig. 122), but are mostly strongly pronounced (figs 123-124). Two types of ornamentation occur, which correspond to the original descriptions of *L. signifera* or *L. ploenensis*. They differ as follows.

- f. *signifera* (figs 125-126): ornamentations rigid, with edges consisting of semicircles, as in *L. myersi*.
- f. *ploenensis* (figs 123-124): ornamentation consists of variably pronounced, simple folds.

Further variable characters are the size of the specimens and the shape of the head aperture and foot plate.

Note

L. jaintiaensis Sharma, 1987 (Figs 127-128, holo- and paratypes in Dept of Zoology, North-East Hill University, Shillong, India.), known from a rice field in Nartiang, Jaintia Hills district, Meghalaya State, India, is, at the least (incompletely contracted


50 µm
122
123
124
125
126
127
128
129
130
131

specimens?) closely related to *L. signifera*. It has a smooth lorica and its foot pseudosegment projects slightly.

Measurements: DPl. 146-148, DPw. 122-124, VPl. 160, VPw. 68, toe l. 85.

27. *Lecane pyrrha* Harring & Myers, 1926
Figs 129-131

Harring & Myers 1926 p. 331-332 plate 12 figs 3-6; Koste & Shiel 1990 p. 31 plate 14 fig. 2.

Type locality and type

Atlantic City, New Jersey; Oneida and Vilas Counties, Wisconsin; Mount Desert Island, Maine, U.S.A. Paratype in PANS.

Differential diagnosis

L. pyrrha needs careful comparison with *L. signifera*. The species has a more elongate lorica, and the lateral margins of its ventral plate are almost straight, nearly parallel, without the peculiar, smooth anterior notches of *L. signifera*. Its head aperture margins are pronouncedly concave (more or less straight in *L. signifera*), and its lorica is always smooth, which is rare in *L. signifera*.

The foot pseudosegment of *L. pyrrha* and *L. signifera* is non-projecting, which distinguishes the species from *L. pertica*.

Description

Loricate *Lecane*. Dorsal plate wider than ventral plate, smooth. Head aperture margins coincident, strongly concave. Antero-lateral spines present, formed by ventral and dorsal plates. Ventral plate elongate, with incomplete transverse and longitudinal folds, smooth. Lateral margins smooth, nearly straight and parallel. Lateral sulci deep, more pronounced posteriorly. Foot plate broad, rounded posteriorly. Coxal plates rounded triangular. Prepedal fold elongate, narrow, distally with median projection. Foot pseudosegment squarish, parallel-sided, not projecting. Toes long, parallel-sided, tapering to point. No claws.

Measurements: DPl. 193, DPw. 145, VPl. 210, VPw. 125, toe l. 75.

Distribution

Repeated records from North America, a single record from Australia.

←

Figs 122-126: L. signifera. 122-123, 125: ventral view, 124, 126: dorsal view. 125-126: f. *ploenensis*.
Figs 127-128: L. jaintiaensis. 127: ventral view, 128: dorsal view.
Figs 129-131: L. pyrrha. 129-130: ventral view, 131: dorsal view.
(122-124: Rio Abobral, Pantanal region, Brazil; 125-126, 129-131: after Harring & Myers, 1926; 127-128: after Sharma, 1987)

28. *Lecane depressa* (Bryce, 1891)
Figs 62, 132-135

Synonyms: *L. brachydactyla* (Stenroos, 1898) Harring, 1913a (n. syn.)
L. amban (Stewart, 1908)
L. truncata (Leissling, 1914) Harring & Myers, 1926 non (Turner, 1898)
L. tudicola Harring & Myers, 1926 (n. syn.)
L. truncata Yamamoto, 1953 non (Leissling, 1914) nec (Turner, 1898)

non *L. depressa* after Harring & Myers (1926)

Bryce 1891 p. 205-206 figs 180-183 (*Distyla depressa*); Stenroos 1898 p. 160 plate 2 fig. 20 (*Cathypna brachydactyla*); Stewart 1908 p. 320, text fig. (*Cathypna amban*); Sachse *in* Brauer 1912 p. 172 (*C. luna* var. *brachydactyla*); Murray 1913c p. 554 plate 23 fig. 15 (*C. brachydactyla*); p. 555 plate 23 fig. 18 (*Cathypna depressa*); Harring 1913a p. 60, p. 61 (*Lecane depressa*); Leissling 1914 p. 255 fig. 2 (*Distyla truncata*); Harring 1921 p. 9 plate 3 figs 5, 6; Harring & Myers 1926 p. 328-329 plate 11 figs 1, 2 (*L. tudicola*); p. 337-338 plate 15 figs 5, 6 (*L. brachydactyla*); Yamamoto 1953 p. 18 fig. 5 (*L. truncata*); Tarnogradski 1961b p. 39 figs 8, 9 (*L. brachydactyla*); p. 49-50 fig. 47 (*L. tudicola*); Kutikova 1970 p. 454 fig. 620 (*L. tudicola*); p. 455-456 fig. 621 (*L. brachydactyla*); Chengalath & Mulamoottil 1974 p. 952 figs 39, 40 (*L. tudicola*); Koste 1978 p. 211 plate 70 figs 1a, b, 3a, b; 10 (*L. tudicola*, *L. brachydactyla*); Koste & Shiel 1990 p. 19 plate 8 fig. 4 (*L. brachydactyla*); p. 34 plate 16 fig. 1 (*L. tudicola*).

Type locality
River Lea, below the Lea Bridge Waterworks, U.K.

Differential diagnosis
The species can be confused with *L. levistyla*, but its dorsal plate is at most as wide as the ventral. In *L. levistyla*, the dorsal plate is distinctly wider than the ventral and the ventral head aperture margins are less concave than in *L. depressa*. From *L. ligona*, *L. depressa* differs by its larger size, and by having a truncate or weakly bilobate posterior margin of the foot plate (with projections in *L. ligona*).

Description
Lorica stiff. Dorsal plate narrower than ventral plate, smooth. Head aperture margin dorsally variable, ventrally concave, with conspicuous antero-lateral spines. Ventral plate broad, slightly converging anteriorly. Transverse fold incomplete. Lateral margins smooth, curved. Lateral sulci deep. Foot plate broad, with conspicuous rounded coxal plates. Prepedal fold relatively broad, posterior margin with median projection. Foot pseudosegment simple, non-projecting. Posterior margin of foot plate truncate or weakly bilobate. Toes short, parallel-sided up to medially then tapering. No claws. Male: see fig. 62

Measurements: DPl. 100-130, DPw. 85-115, VPl. 110-150, VPw. 78-119, toe l. 20-44.

Distribution
Cosmopolitan. The species is a cold-stenotherm, living between submerged mosses in soft, acid waters.

Comments
The differences, reported to differentiate between *L. depressa*, *L. truncata* and *L. brachydactyla* (difference in relative length of the toes and presence or absence of notches, lateral of the foot plate: compare figs 133 and 135) appear to be variable. Their taxonomic relevance can, therefore, not be confirmed.

29. *Lecane lauterborni* Hauer, 1924
Figs 136-137

non *L. lauterborni* after ?Koste (1988a), Segers (1992), Segers & Dumont (1993b)

Hauer 1924 p. 145-147 figs 1-3; Harring & Myers 1926 p. 347 plate 20 figs 5, 6; Kutikova 1970 p. 453-454 fig. 617; Koste 1978 p. 209 plate 69 figs 7a-b.

Type locality
Stöcklewald near Triberg, F.R.G.

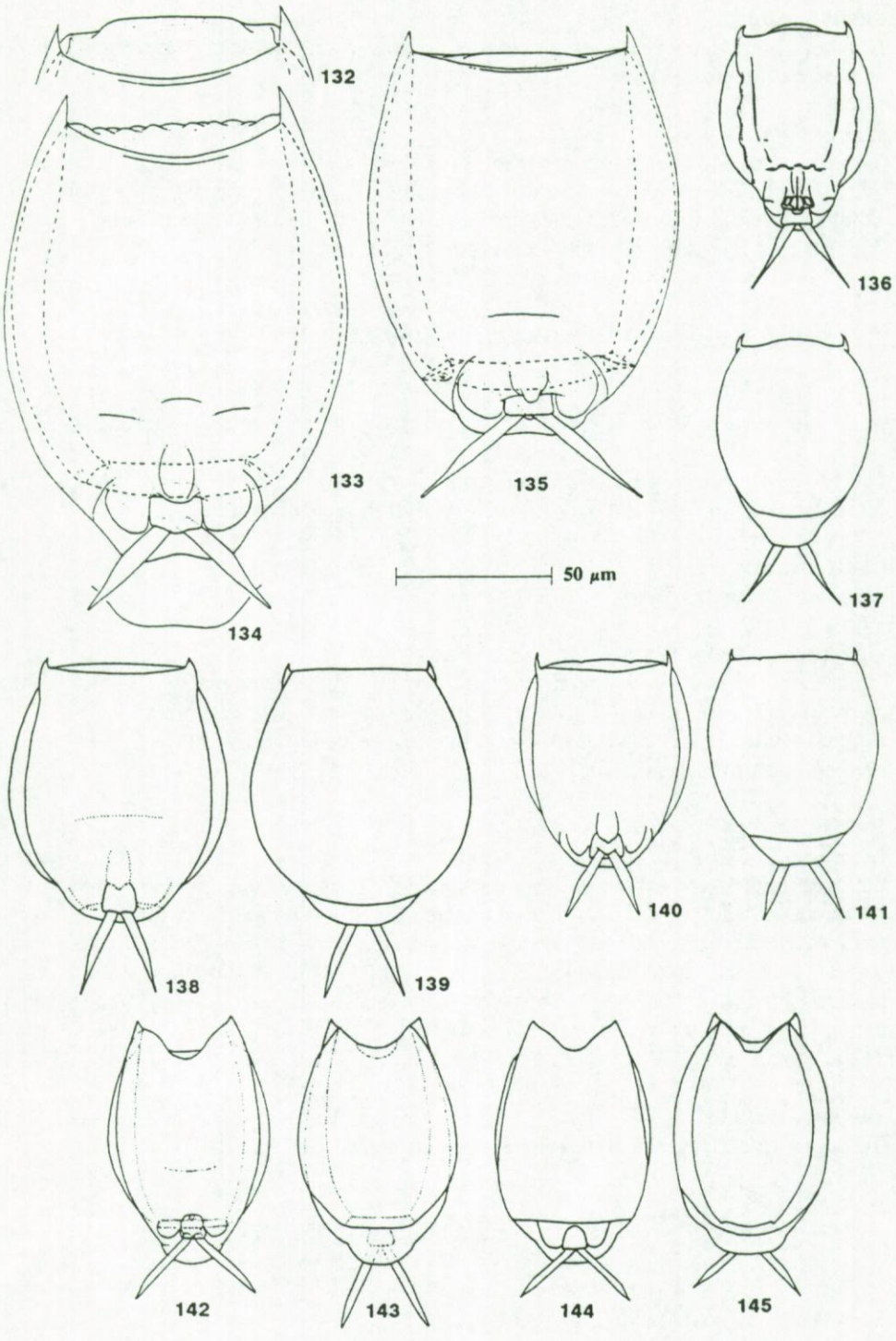
Differential diagnosis
L. lauterborni is close to *L. rhytida* and, especially, *L. donneri*. It is distinguished from these by its non-projecting foot pseudosegment. The distinction between *L. lauterborni* and *L. levistyla* is based on the difference in relative length, and shape of toes and general lorica shape.

Description
Lorica stiff. Dorsal plate medially wider than ventral plate, smooth. Head aperture margins almost coincident, slightly convex, with antero-lateral spines. Ventral plate longer than wide, with incomplete transverse and longitudinal folds. Lateral margins irregularly undulate, nearly parallel. Foot plate relatively narrow, with rounded coxal plates. Prepedal fold narrow, elongate, distally with median projection. Foot pseudosegment not projecting, broadest distally. Toes characteristic: parallel-sided proximally, tapering from the middle onwards. No claws.
Measurements: DPl. 58-92, DPw. 51-82, VPl. 67-110, VPw. 41-70, toe l. 25-42.

Distribution
Europe, North America. Between submerged mosses (especially *Sphagnum*).

30. *Lecane levistyla* (Olofsson, 1917)
Figs 138-141, 510-511

Synonyms: *L. scobis* Harring & Myers, 1926
?*L. mitis* Harring & Myers, 1926


132
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Metopidia lepadella after Jakubski (1914)
non *L. levistyla* after Koste (1972), Hada (1938, *sub. L. scobis*)

Olofsson 1917 p. 280 fig. 10 (*Cathypna levistyla*); Harring & Myers 1926 p. 329 plate 11 figs 3-4 (*L. mitis*); p. 329-330 plate 11 figs 5-6 (*L. scobis*); Retowski, 1933 (*Lecane levistyla*); Wiszniewski 1934a p. 150 plate 6 figs 10a, b; Wiszniewski 1934b p. 382-383 plate 63 figs 76-77; Koch-Althaus 1963 p. 416 fig. 26c; Kutikova 1970 p. 453 fig. 616; Koste 1978 p. 210 plate 69 fig. 4 (partim); Koste & Shiel 1990 p. 25 plate 11 fig. 5.

Type locality
Lake near Valdö, Finmarken, Norway.

Differential diagnosis
L. levistyla has been confused with *L. depressa*, but is generally smaller and has a medially wider dorsal than ventral plate. Careful comparison with *L. lauterborni* is necessary: *L. levistyla* has a relatively broader lorica, a nearly smooth ventral plate and different toe shape.

Description
Loricate *Lecane*. Dorsal plate anteriorly narrower, medially wider than ventral plate. Head aperture margin ventrally slightly concave, dorsally straight, antero-lateral corners with spines. Dorsal plate smooth, lateral edges reach head aperture. Ventral plate longer than wide, smooth. Transverse fold incomplete. Lateral margins smooth, slightly curved. Foot plate broad, coxal plates rounded. Prepedal fold narrow, elongate, distally with median projection. Foot pseudosegment squarish, not projecting. Toes long, parallel-sided to the middle then tapering. No claws. Male: Figs 510-511 (see Wiszniewski, 1934a).

Measurements: DPl. 95-114, DPw. 88-102, VPl. 103-123, VPw. 77-88, toe I. 35-43.

Distribution
Insufficiently known due to frequent misidentifications.

Comments
L. mitis Harring & Myers, 1926 resembles an imperfectly contracted *L. levistyla*, and is here tentatively considered a synonym of *L. levistyla*, as suggested by Wiszniewski (1954, *sub. L. depressa mitis*). The taxon has not been recorded since its description.

←
Figs 132-135: L. depressa, ventral view. 132: head aperture, 134: posterior margin.
Figs 136-137: L. lauterborni. 136: ventral view, 137: dorsal view.
Figs 138-141: L. levistyla. 138, 140: ventral view, 139, 141: dorsal view.
Figs 142-143: L. herzigi. 142: ventral view, 143: dorsal view.
Figs 144-145: L. ordwayi. 144: ventral view, 145: dorsal view.
(132-134: pond near Lake Glubokoe, Russia; 135: Iceland; 136-137: after Hauer, 1924; 138-139: after Harring & Myers, 1926 (sub. *L. scobis*); 140-141: after Wiszniewski, 1934b; 142-143: after Koste *et al.*, 1988; 144-145: after Bienert, 1986).

31. *Lecane herzigi* Koste, Shiel & Tan, 1988
Figs 142-143

Koste, Shiel & Tan, 1988 p. 125 figs 12-14; Koste & Shiel 1990 p. 23 plate 10 fig. 3; Sanoamuang & Stout 1993 p. 488 fig. 4.

Type locality and types
Dune pools, western Tasmania. Holotype and paratypes in SAM, paratypes in SMF and in the collection of R. J. Shiel.

Differential diagnosis
L. herzigi is strikingly similar to *L. ordwayi*, but differs in body proportions and in the head aperture, which has a projecting dorsal margin (ventral in *L. ordwayi*). Additionally, the species is reported to have a more pronounced lobate posterior end of foot plate than *L. ordwayi*.

Description
Loricate *Lecane*. Dorsal plate anteriorly narrower, medially wider than ventral plate, smooth. Head aperture margins strongly concave, dorsal projecting, antero-lateral spines present. Ventral plate longer than wide, with incomplete or complete transverse fold. Lateral margins smooth, curved. Lateral sulci deep. Foot plate wide, with rounded coxal plates and nearly square, non-projecting foot pseudosegment. Prepedal fold narrow, elongate, distally with median projection. Posterior edge of ventral plate with rounded lobe. Two toes, no claws.

Measurements: DPl. 96-100, DPw. 74-75, VPl. 117-177(?), VPw. 65-70, toe l. 38-39.

Distribution
Tasmania and New Zealand. Probably endemic to the region.

Comments
The taxonomic relation between *L. ordwayi* and *L. herzigi* needs revision.

32. *Lecane ordwayi* Bienert, 1986
Figs 144-145

Bienert 1986 p. 176-177 figs 1-3; Koste & Shiel 1990 p. 23.

Type locality and types
Ross Lake, North-Central Florida, U.S.A. Holotype and paratypes in NMNH.

Differential diagnosis
L. ordwayi resembles *L. depressa*, but differs distinctively by the shape of its head aperture. The species is close to *L. herzigi*, but differs from it in several aspects, as listed above.

Description
Loricate *Lecane*. Dorsal plate anteriorly narrower, medially wider than ventral plate, smooth. Head aperture margins strongly concave, ventral projecting. Antero-lateral spines present. Ventral plate longer than wide, with inconspicuous transverse fold. Lateral margins smooth, curved. Lateral sulci deep. Foot plate wide, with rounded coxal plates and nearly square, non-projecting foot pseudosegment. Prepedal fold narrow, elongate, distally with median projection. Posterior edge of ventral plate with rounded lobe. Two toes, no claws.

Measurements: DPl. 113-121, DPw. 88-99, VPl. 125-142, VPw. 82-92, toe l. 40-44.

Distribution
A single record from Florida, U.S.A.

33. *Lecane ligona* (Dunlop, 1901)
Figs 146-153

Synonyms: *L. jessupi* Harring, 1921
?*L. pycina* Harring & Myers, 1926
L. abnobensis Hauer, 1929

Dunlop 1901 p. 29 plate 2 figs 4-6 (*Cathypna ligona*); Murray 1913c p. 554 plate 23 fig. 16; Harring 1913a p. 61 (*Lecane ligona*); Harring 1921 p. 8 plate 3 figs 3, 4 (*L. jessupi*); Harring & Myers 1926 p. 338-339 plate 15 figs 3-4 (*L. jessupi*); p. 339-340 plate 16 figs 3-6 (*L. ligona*); p. 340 plate 17 figs 5, 6 (*L. pycina*); Hauer 1929 p. 149-150 figs 6a, b (*L. abnobensis*); Kutikova 1970 p. 456 fig. 622 (*L. ligona*); fig. 623 (*L. ligona abnobensis*); fig. 624 (*L. jessupi*); Koste 1978 p. 211 plate 70 figs 4a, b (*L. brachydactyla* var. *pycina*); p. 212 plate 70 figs 5a, b (*L. ligona jessupi*); p. 212 plate 70 figs 6a, b (*L. ligona* f. *abnobensis*); p. 211-212 plate 70 figs 8a, b.

Type locality
Arran Island, U.K.

Differential diagnosis
L. ligona can be confused with *L. depressa*, although it is easily distinguished by the presence of a posterior projection on the ventral plate, and by its generally smaller size.

Description
Lorica stiff. Dorsal plate narrower than ventral plate, smooth. Head aperture margin dorsally nearly straight, convex or irregular, ventrally concave. Antero-lateral spines present. Ventral plate broad, transverse fold incomplete. Lateral margins smooth, curved. Lateral sulci deep. Foot plate broad, with rounded coxal plates. Posterior margin of lorica truncate, with variable postero-lateral corners. Prepedal fold relatively broad, posterior margin with median projection. Foot pseudosegment simple, non-projecting. Toes short, parallel-sided up to medially then tapering. No claws.

Measurements: DPl. 66-93, DPw. 60-93, VPl. 80-108, VPw. 70-96, toe l. 18-30.

Distribution
Insufficiently known. Available records suggest a Holarctic distribution.

Comments
The shape of the posterior projection of the ventral plate is variable, as reflected in figs 146-153. Similar cases are presented by *L. ludwigii* and *L. leontina*. As it is unlikely that this polymorphism has any taxonomic significance, taxa, diagnosed on this character are treated as synonyms here. The lorica shape of *L. pycina* (Figs 152-153) deviates in a number of aspects from that of *L. depressa* (width of dorsal plate, position of anterior spines). As this may result from incomplete contraction, the taxon is here treated as a synonym, following Koste (1978).

Some frequent variants concerning shape of posterior projection can be referred to as follows:

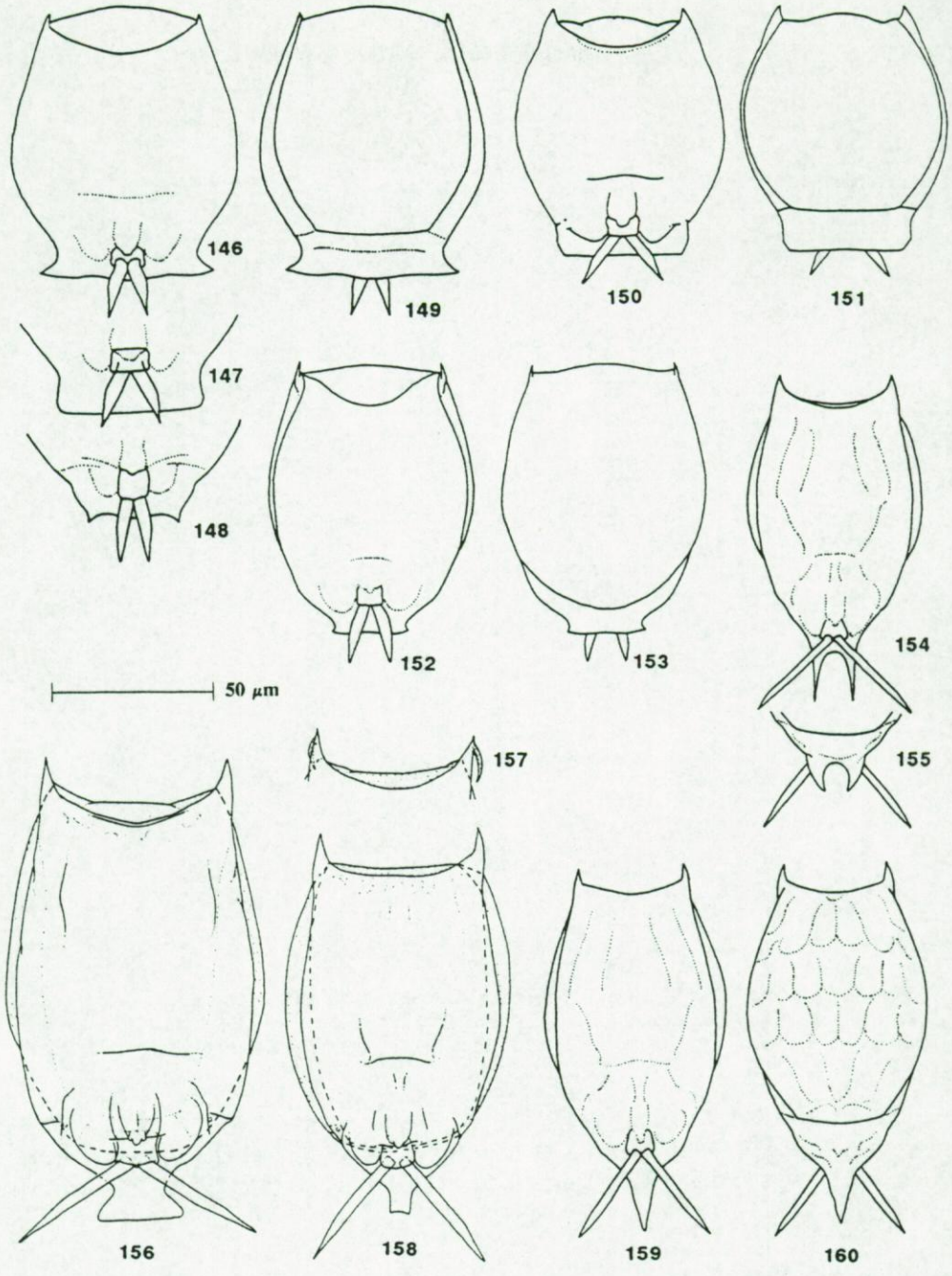
– f. *abnobensis*: see figs 150-151;
– f. *jessupi*: see figure 148;
– f. *pycina*: see figus 152-153

34. *Lecane ludwigii* (Eckstein, 1883)
Figs 19, 23, 59, 154-174

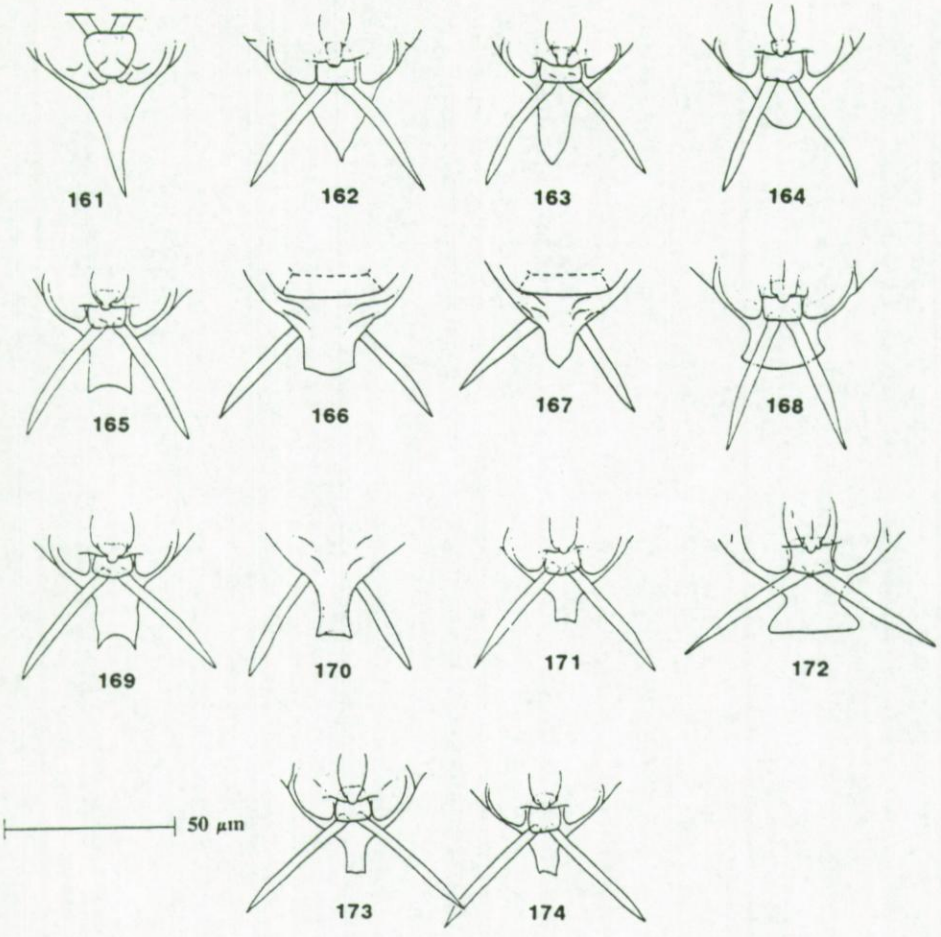
Synonyms: *L. ohioensis* (Herrick, 1885) Harring, 1913a
L. stokesi (Pell, 1890) Harring, 1913a (n. syn.)
L. ichthyoura (Anderson & Shephard, 1892) Harring, 1913a
L. appendiculata (Levander, 1894) Wiszniewski, 1954
L. ornata (Daday, 1897)
L. oxycauda (Stenroos, 1898)
L. appendiculata (Daday, 1901) non (Skorikov, 1898) nec (Levander, 1894)
L. marshi Harring, 1914
L. ercodes Harring, 1914
L. jorroi (Arévalo, 1918) Wiszniewski, 1932a

Infrasubspecific taxa: var. *brevicaudata* Hauer, 1938; var. *lacinulata* Hauer, 1938; var. *abrupta* Hauer, 1938; var. *laticaudata* Hauer, 1938.

Eckstein 1883 p. 383 plate 26 fig. 37 (*Distyla ludwigii*); Herrick 1885 p. 54 fig. 1 (*Distyla ohioensis*); Pell 1890 p. 144, text fig. (*Cathypna stokesi*); Anderson & Shephard 1892 p. 78 plate 12 fig. 5 (*Distyla ichthyoura*); Levander 1894 p. 50 plate 3 fig. 30 (*Cathypna appendiculata*); Daday 1897 p. 135 fig. 4 (*Diplax ornata*); Stenroos 1898 p. 162 plate 2 figs 23-25 (*D. oxycauda*); Daday 1901 p. 456 plate 24 figs 10, 11 (*Distyla appendiculata*); Harring 1913a p. 61-62 (*Lecane ichthyoura*, *L. ludwigii*, *L. ohioensis*); Harring 1914 p. 537 plate 18 figs 1-3 (*L. marschi*); p. 537-538 plate 18 figs. 4-6 (*L. ercodes*); Arévalo 1918 p. 1-47 (*Cathypna jorroi*).



Figs 146-153: L. ligona. 146-148, 150, 152: ventral view, 149, 151, 153: dorsal view, 147, 148: foot plate and toes. 148: f. *jessupi*, 150-151: f. *abnobensis*, 152-153: '*L. pycina*'.
Figs 154-160: L. ludwigii. 154, 156-159: ventral view, 155, 160: dorsal view, 157: head aperture, 155: posterior projection. 154-155: f. *stokesi*, 156: f. *ichthyoura*, 158: f. *ohioensis*; 159-160: f. *ludwigii*. (146-149, 152-155, 159-160: after Harring & Myers, 1926; 150-151: after Hauer, 1929; 156: after Segers *et al.*, 1992; 157: Rio Abobral, Pantanal region, Brazil; 158: Nigeria (Segers *et al.*, 1993a)).



Figs 161-174: L. ludwigii, posterior projections. 161: f. *ludwigii*, 164: f. *ercodes*, 165, 171, 173-174: f. *ohioensis*, 168, 172: f. *ichthyoura*.
(161, 163-165, 169, 173, 174: Nigeria (Segers *et al.*, 1993a: partly sub. *L. ohioensis*); 162, 168, 171: Saudi Arabia (Segers & Dumont, 1993b.); 166: Er Hoi Lake, near Dali, Yunnan, China; 167: Yuangshuo, near Guilin, Zizhiqu, China; 170: lagoon near Boa Vista, Roraima, Brazil; 172: Turkey (Segers *et al.*, 1992)).

See De Ridder (1960), Harring & Myers (1926), Hauer (1929), Hauer (1938), Kertész (1955), Koste (1978), Koste & Shiel (1990), Kutikova (1970), Wiszniewski (1954).

Differential diagnosis
L. ludwigii is distinguished from *L. ligona* by its medially wider dorsal than ventral plate, and from *L. ploenensis* by its dorsal plate being narrower than the ventral plate anteriorly. The species is further characterised by the presence of a variable posterior projection on the foot plate.

Description
Lorica stiff. Dorsal plate medially wider than ventral plate, ornamented. Head aperture margins almost coincident, slightly concave, with strong antero-lateral spines. Ventral plate elongate, nearly parallel-sided, with incomplete transverse and longitudinal folds, ornamented. Lateral margins smooth, slightly curved. Lateral sulci deep. Foot plate wide, with rounded triangular coxal plates. Prepedal fold narrow, elongate, distally with median projection. Posterior margin with variable projection. Foot pseudosegment not projecting, simple. Toes parallel-sided, no claws.

Measurements: DPl. 98-140, DPw. 70-84, VPl. 130-165, VPw. 63-80, toe l. 36-50.

Distribution
Cosmopolitan, rather common in fresh and slightly saline water.

Comments
1) All synonyms listed were based on specimens with a virtually identical morphology, but for the shape of the posterior projection of the foot plate (see figs 161-174). Different authors proposed various ways of dealing with this variability, and considered them to be different species, subspecies, varieties or forms, or any combination of these categories. The high number of named variants, the records of intermediates between all 'typical' shapes, and the fact that it is exclusively the shape of the posterior projection that differentiates between them, are all arguments in favour of their synonymy. Therefore, they are treated here as synonyms representing a single species in which one character is subject to polymorphic variation. Indications that ecological factors (e.g. salinity) have some impact on this polymorphism have been recorded, but need substantiation.

Some of the commonest, easily recognisable variants can be referred to as follows.

- f. *ludwigii* (figs 159-161): posterior projection a single spine;
- f. *stokesi* (figs 154-155): posterior projection two spines;
- f. *ercodes* (figs 23, 164): posterior projection semicircular;
- f. *ohioensis* (figs 158, 165, 171, 173-174): posterior projection rectangular;
- f. *ichthyoura* (figs 19, 156, 168, 172): posterior projection diverging caudally, with straight or rounded posterior margin. This variant is reported to be connected to a saline habitat.

2) The spelling '*L. ludwigi*' (single terminal *-i*) after Wiszniewski (1954) and most subsequent authors, is incorrect according to the ICZN.

35. *Lecane candida* Harring & Myers, 1926
Figs 175-176

Harring & Myers p. 368-369 plate 14 figs 1, 2; Kutikova 1970 p. 446 fig. 596; Koste 1978 p. 217 plate 72 figs 3a, b.

Type locality
Loon Lake, Wisconsin, U.S.A.

Differential diagnosis
Although originally considered a relative of *L. grandis* and *L. papuana*, the lorica shape of *L. candida* resembles more *L. nana* (smooth lorica, anterior edges of dorsal and ventral head aperture margins equally wide). *L. candida* has toes bearing pseudoclaws and accessory claws, which distinguishes the species from *L. nana*.

Description
Lorica stiff. Dorsal plate anteriorly as wide as, medially wider than ventral plate, smooth. Head aperture margins coincident, slightly convex, antero-lateral corners angulate. Ventral plate longer than wide, with incomplete transverse and longitudinal folds. Lateral margins smooth, nearly parallel, with antero-lateral notches. Foot plate broad, with rounded triangular coxal plates and simple, non-projecting foot pseudosegment. Prepedal fold narrow, elongate, posterior margin with median projection. Toes parallel-sided, bearing pseudoclaws and accessory claws.

Measurements: DPl. 65, DPw. 56, VPl. 72, VPw. 48, anterior edge w. 48, toe l. 22, claw 7.

Distribution
A single record from the type locality and one from Uzbekistan (non-illustrated record).

36. *Lecane latissima* Yamamoto, 1955
Figure 46-49, 177

Synonyms: *L. rotundata* (Olofsson, 1918) Remane, 1932 non (Jakubski, 1914).
L. kostei De Ridder, 1966 (n. syn.)

non ?*L. latissima* after Segers (1992)

Olofsson 1918 p. 593 fig. 53 (*Cathypna rotundata*); Remane, 1932 p. 110; Yamamoto, 1955 p. 33 fig. 1 (*L. latissima*); Pejler 1962 p. 368 fig. 93 (*L. rotundata*); De Ridder 1966 p. 151 fig. 19 (*L. kostei*); Kutikova 1970 p. 446 fig. 603 (*L. rotundata*); Koste 1978 p. 220 plate 73 figs 2a, b, 4a, b (*L. rotundata*); Koste & Shiel 1990 p. 31-32 plate 14 fig. 4 (*L. rotundata*); Segers 1993 p. 52-53.

Type locality
Taka-numa pond, Ahimokita Peninsula, Japan.

Differential diagnosis
L. latissima is at once distinguished from *L. hornemanni* by its toes bearing claws. The species is as variable in shape as *L. hornemanni*. Specimens with knobby spheres on the lorica, as recorded for *L. hornemanni*, have been observed. It is distinguished from *L. abanica* by its larger size, rounder lorica, and different ventral plate, from *L. ruttneri* by its larger size, its dorsal plate being wider than long and, also, its different ecology.

Description
Lorica relatively soft. Dorsal plate wider than ventral plate, smooth or ornamented

with knobby hemispheres. Head aperture margins nearly coincident, straight or slightly convex, with rounded antero-lateral corners. Ventral plate slightly longer than wide, with incomplete transverse and longitudinal folds, smooth or ornamented. No lateral sulci. Foot plate broad, coxal plates rounded triangular. Prepedal fold relatively broad, elongate, distally with median projection. Foot pseudosegment rectangular or constricted medially, not or clearly projecting. Toes long, parallel-sided, bearing incompletely separated claws.

Measurements: DPl. 90, DPw. 106-112, VPl. 103-113, VPw. 103, toe l. 33, claw l. 6.

Distribution and ecology

L. latissima is a cold-stenotherm, recorded from Northern Europe, Japan, Tasmania (?) and New Zealand.

Comments

The conspecificity of *L. latissima* and *L. kostei* was ascertained by the comparison of material from New Zealand and Europe with topotypical material of *L. kostei* (Iceland; see figure 177).

37. *Lecane ruttneri* Hauer, 1938
Figs 7, 183

Hauer 1938 p. 523 figs 46a-b; Koste 1972 p. 396-397 plate 26 fig. 3 (*L.* cf. *ruttneri*); Koste & Shiel 1990 p. 33 plate 14 fig. 5; Segers 1992 p. 356 fig. 3c; Segers *et al.* 1994 p. 252-253 fig. 3.

Type locality and types

Danau de Atas, Sumatra, Indonesia. Apparent syntypes in RUG.

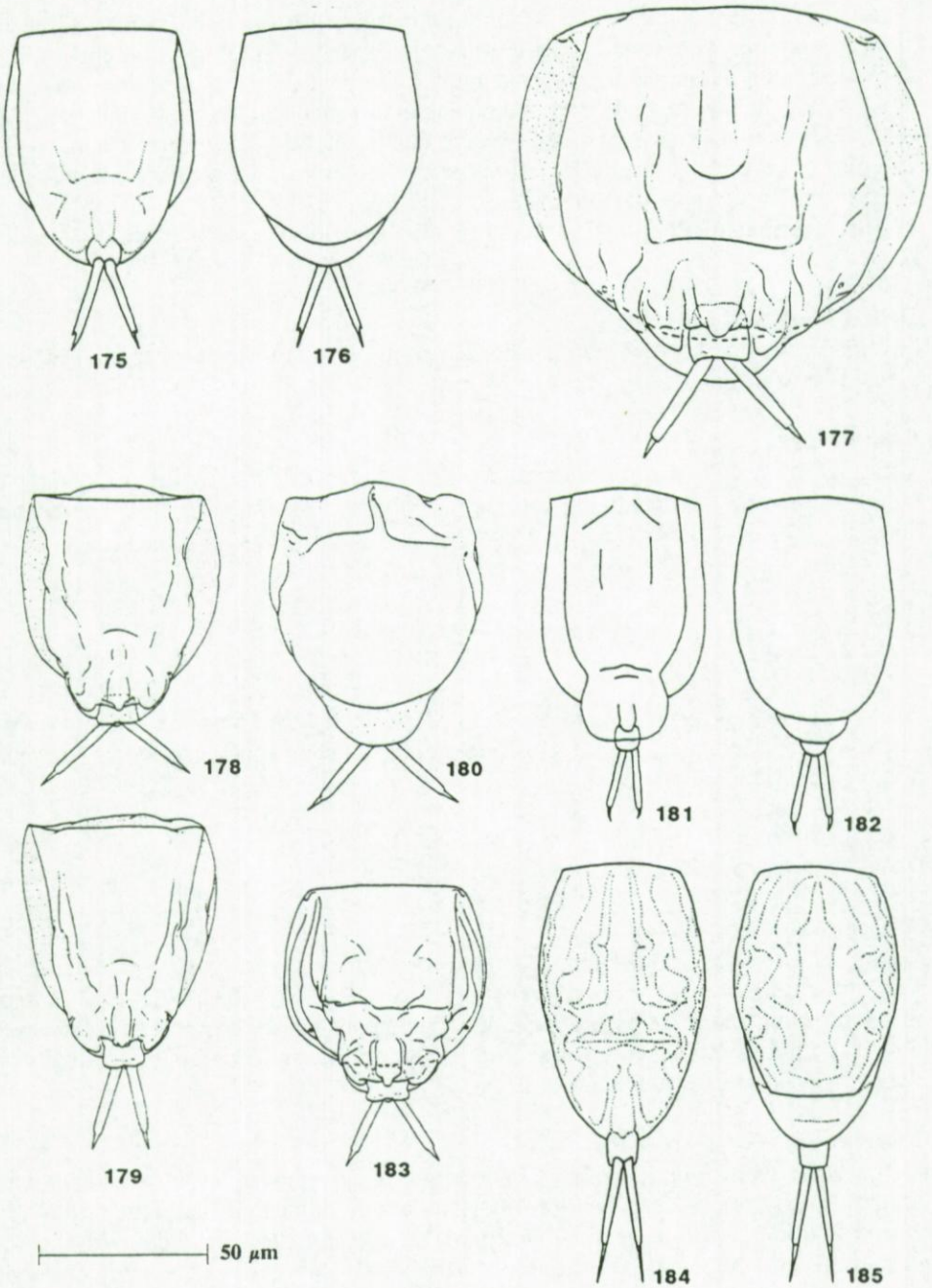
Differential diagnosis

L. ruttneri resembles *L. abanica*, *L. hornemanni* and *L. latissima*. It is distinguished from *L. abanica* by its relatively short lorica and by the shape of its foot pseudosegment; from *L. hornemanni* by the presence of incompletely separated claws, and by its smaller size; from *L. latissima* by its smaller size, elongate dorsal plate, stiffer lorica and different ecology.

Description

Lorica stiff. Dorsal plate wider than ventral plate, smooth or ornamented with knobby hemispheres. Head aperture margins nearly coincident, straight or slightly convex, with angulate corners. Ventral plate slightly longer than wide, with incomplete transverse and longitudinal folds, occasionally ornamented. Lateral margins smooth or irregularly folded. Lateral sulci absent. Foot plate broad, coxal plates rounded. Prepedal fold narrow, elongate, distally with median projection. Foot pseudosegment rectangular, constricted laterally, not projecting. Toes parallel-sided, with incompletely separated claw.

Measurements: DPl. 53-60, DPw. 48-50, VPl. 62-64, VPw. 50-56, toe l. 19-22, claw l. 5.



Figs 175-176: L. candida. 175: ventral view, 176: dorsal view.
Fig. 177: L. latissima, ventral view.
Figs 178-180: L. abanica. 178, 179: ventral view, 180: dorsal view.
Figs 181-182: L. urna. 181: ventral view, 182: dorsal view.
Fig. 183: L. ruttneri, ventral view.
Figs 184-185: L. elongata. 184: ventral view, 185: dorsal view.
(175-176, 184-185: after Harring & Myers, 1926; 177: Iceland; 178-180: after Segers, 1994; 181-182: after Nogrady, 1962; 183: after Segers *et al.*, 1994).

Distribution
L. ruttneri is recorded from several localities in Africa (incl. Madagascar), the Oriental and Neotropical region, and Notogaea. The species may be a cosmo(sub)tropical warm-stenotherm. It is relatively rare.

38. *Lecane elongata* Harring & Myers, 1926
Figs 184-185

Synonym: ?*L. lebedevae* Abdullaev, 1989 (n. syn.)

Harring & Myers 1926 p. 372 plate 31 figs 1, 2; Kutikova 1970 p. 448 fig. 600; Koste 1978 p. 218-219 plate 72 figs 10a, b.; Abdullaev 1989 p. 127-128 figs a, b (*L. lebedevae*).

Type locality
Doughty Mill pond, near Atlantic City, New jersey, U.S.A.

Differential diagnosis
L. elongata resembles *L. tenuiseta* and *L. inermis*. It is distinguished from these by its relatively stiff, elongate and ornamented lorica.

Description
Lorica elongate. Dorsal plate only medially wider than ventral plate, ornamented. Head aperture margins coincident, slightly convex, antero-lateral corners angulate. Ventral plate elongate, with incomplete transverse and longitudinal folds, ornamented. Lateral margins irregularly undulate. Lateral sulci shallow. Foot plate relatively narrow, coxal plates rounded triangular. Prepedal fold narrow, elongate, distally with median projection. Foot pseudosegment elongate, projecting. Toes parallel-sided, bearing long, completely separated claws.

Measurements: DPl. 120, VPl. 145, Lw. 84, ant. edge w. 60, toe l. 38, claw l. 20.

Distribution
Recorded from the U.S.A., Europe, India. Lives between submersed *Sphagnum*. A rare species.

Comments
The holotype of *L. lebedevae* has to be considered lost: it could not be found in the vial in which it was deposited in the Museum of Moscow University. The differences between *L. lebedevae* and *L. elongata*, cited by Abdullaev (1989), are subtle and are likely to result from differences in contraction.

39. *Lecane urna* Nogrady, 1962
Figs 181-182

Nogrady 1962 p. 681 figs 5a, b.

Type locality
Sphagnum bog 'Köhegyi tó', near Pomáz, Hungary.

Differential diagnosis
L. urna is close to *L. abanica*. In *L. urna*, the ventral plate is nearly parallel-sided (diverging to anterior in *L. abanica*), and it has a more separated foot plate. *L. urna* bears some resemblance to *L. latissima* and *L. ruttneri*, but is smaller, has a more elongate lorica and protruding foot plate.

Description
Lorica elongate, nearly parallel-sided, dorsal plate wider than ventral plate. Head aperture margins coincident, slightly convex, antero-lateral corners angulate. Ventral plate longer than wide, with some longitudinal and an incomplete transverse fold. Lateral margins smooth, straight, nearly parallel. Foot plate distinctly separated. Foot pseudosegment simple, projecting. Toes parallel-sided, bearing completely separated, incurvate claws.

Measurements: DPl. 72, DPw. 53, VPl. 80, VPw. 40-42, toe l. 38-40.

Distribution
A single record from the type locality.

40. *Lecane abanica* Segers, 1994
Figs 57-58, 178-180

?*L. rotundata* after Segers (1992)

Segers 1992 p. 355 figs 3a, b (?*L. rotundata*); Segers 1994 p. 244-245 figs 1a-e.

Type locality and types
Al-Aba oasis, Saudi Arabia. Holotype and paratypes in SNMNH; paratypes in KBIN and RUG.

Differential diagnosis
L. abanica can be confused with *L. latissima* and with *L. ruttneri*. It differs from both by its elongate lorica and by the lateral margins of the ventral plate diverging anteriorly. While *L. latissima* is distinctly larger and, especially, broader, *L. ruttneri* has a foot pseudosegment with a strong bilateral constriction and a clear transverse fold on its ventral plate, characters not present in *L. abanica*.

Description
Lorica relatively soft. Dorsal plate wider than ventral, smooth or irregularly folded. Head aperture margins nearly coincident, ventrally and dorsally straight or dorsally with median convexity, antero-lateral corners angulate. Ventral plate longer than wide, with weak, incomplete transverse and elongate longitudinal folds, smooth. Lateral margins smooth or irregularly folded, diverging anteriorly. Lateral sulci absent. Foot plate broad, coxal plates rounded triangular. Prepedal fold narrow, elongate, posterior margin with median projection. Foot pseudosegment nearly rectangular,

not or slightly projecting. Toes parallel-sided, with incompletely separated claws.

Measurements: DPl. 69-79, DPw. 54-64, VPl. 64-83, VPw. 44-50, toe l. 21-31, claw l. 5-7.

Distribution

L. abanica is known from Saudi Arabia and Madagascar. A drawing of a *L. latissima* by Koste *et al.* (1988), copied in Chengalath & Koste (1989) and Koste & Shiel (1990) may also represent this species, indicating that it may be more widely distributed than reported here.

The species was found in slightly saline water.

41. *Lecane proiecta* Hauer, 1956
Figure 186

Hauer 1956 p. 296-297 figs 12a, b; Hauer 1965b p. 364-365 figs 20a-c; Koste 1978 p. 221-222 plate 73 figs 9a-c.

Type locality

Orinoco laguna Barrancas, Brazil.

Differential diagnosis

The peculiar shape of the lorica and toes of *L. proiecta* prevents confusion with any congener. No other *Lecane* has a similar ventral head aperture margin, and similar slender toes.

Description

Lorica stiff. Dorsal plate more or less as wide as, or slightly wider than the ventral plate, stippled. Ventral head aperture margin projecting, bilobate with deep and narrow median sinus, dorsal slightly convex. Antero-lateral corners angulate. Ventral plate slightly longer than wide, transverse fold complete. Lateral margins smooth, slightly curved. Lateral sulci deep. Foot plate relatively narrow with rounded triangular coxal plates. Prepedal fold short, broad, distal margin rounded. Foot pseudosegment not projecting, rectangular. Toes slender, relatively short, parallel-sided with long pseudoclaws and accessory claws.

Measurements: DPl. 77-117, DPw. 87-109, VPl. 112-128, VPw. 92-117, toe l. 21-28, claw l. 8-10.

Distribution

L. proiecta is endemic to the Amazon region, Brazil.

Comments

L. proiecta was originally described as having clawless toes (Hauer, 1956). This was corrected by Hauer (1965b).

42. *Lecane grandis* (Murray, 1913a)
Figure 187

Murray 1913a p. 344-345 plate 13 figs 20a, b (*Cathypna grandis*); Fadeev 1925 p. 20 plate 1 fig. 6 (*Lecane grandis*); Harring & Myers 1926 p. 325-326 plate 10 figs 1, 2; Kutikova 1970 p. 446 fig. 597; Koste 1978 p. 215 plate 72 figs 2a, b, plate 74 figs 6g, h; Koste & Shiel 1990 p. 23 plate 10 fig. 1.

Type locality
Lagoon near Botanical gardens, Rio de Janeiro, Brazil.

Differential diagnosis
This relatively large species is close to *L. luna* and, especially, *L. braumi* and *L. elsa*. It is characterised by its nearly straight head aperture margins.

Description
Relatively large species. Lorica smooth. Dorsal plate narrower than ventral plate, lateral margins may reach head aperture. Head aperture margins nearly coincident or parallel, almost straight. Ventral plate longer than wide, with a near-complete transverse fold. Lateral margins smooth, slightly curved. Foot plate broad, coxal plates rounded triangular. Prepedal fold broad, short, posterior margin rounded. Foot pseudosegment not projecting, widest in its distal part. Toes relatively long, parallel-sided, bearing pseudoclaws and accessory claws. Toes commonly with transverse constrictions about medially.

Measurements: DPl. 125-180, DPw. 105-140, VPl. 140-200, VPw. 112-140, toe l. 40-80, claw l. 10-12.

Distribution
Cosmopolitan in saline waters, not uncommon.

43. *Lecane lateralis* Sharma, 1978
Figure 190

Sharma 1978b p. 191-192 figs 1, 2; Segers *et al.* 1993a p. 67 fig. 7.

Type locality and types
Achipur, West Bengal, India. Holotype and paratype in Zoological Survey of India.

Differential diagnosis
The species can be confused with *L. luna*. It is distinguished by its characteristic

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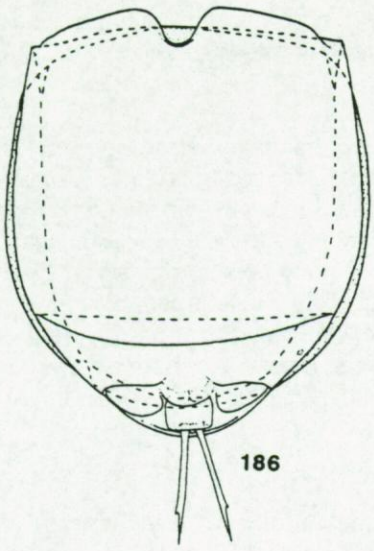
Fig. 186: L. proiecta, ventral view.
Fig. 187: L. grandis, ventral view.
Figs 188-189: L. braumi, ventral view. 188: head aperture
Fig. 190: L. lateralis, ventral view.
(186: Rio Paraguai, Pantanal region, Brazil; 187: Saudi Arabia (Segers & Dumont, 1993b); 188-189: Nigeria (Segers *et al.*, 1993a); 190: after Segers *et al.*, 1993a).



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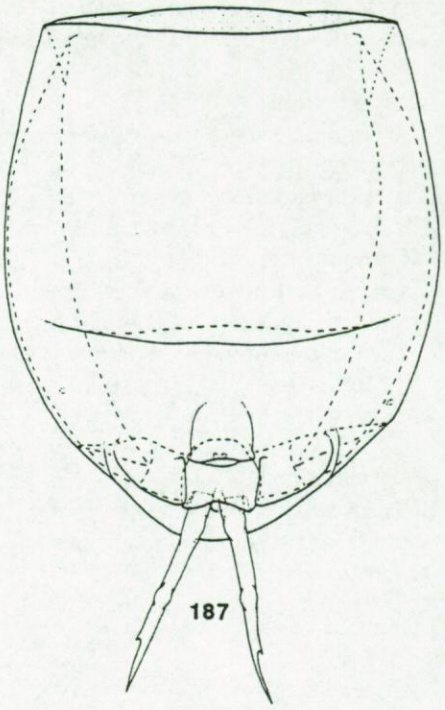

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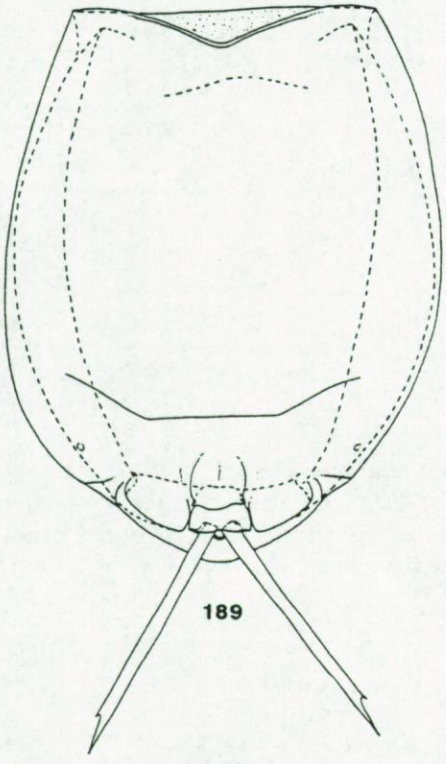

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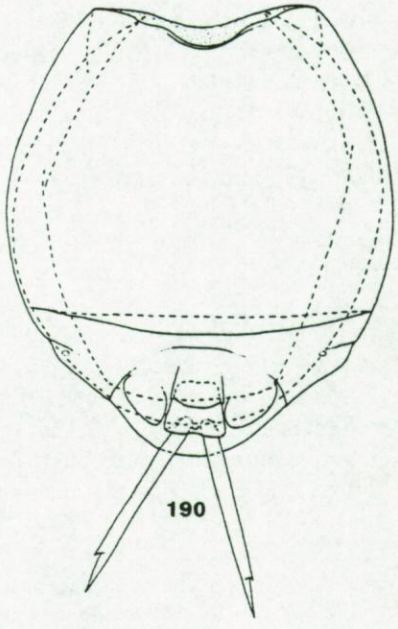


190

50 µm

head aperture margin, especially the ventral which is weakly undulate, and by its angulate antero-lateral corners. Its toes are relatively longer than in *L. luna*.

Description
Loricate *Lecane*. Dorsal plate narrower than ventral plate. Head aperture broadly concave, ventral margin sinuate, antero-lateral corners angulate. Dorsal plate smooth, lateral edges reach head aperture. Ventral plate longer than wide, smooth. Transverse fold complete. Lateral margins smooth, curved. Lateral sulci deep. Rounded extensions in posterior half of ventral plate present or absent. Foot plate broad, coxal plates rounded triangular. Prepedal fold short, broad, posterior margin rounded. Foot pseudosegment trapezoidal, not projecting. Toes long, parallel-sided, bearing incompletely separated, needle-like pseudoclaws. Accessory claws present.
Measurements: DPl. 110, DPw. 101-112, VPl. 106-120, VPw. 106-112, toe l. 42-46, claw l. 10-11.

Distribution
Recorded from localities in India, China, Nigeria and Papua New Guinea. Probably an African and Oriental species.

44. *Lecane papuana* (Murray, 1913c)
Figs 191-194

Synonyms: *L. yamunensis* Novotná-Dvorakova, 1962
L. luna presumpta Ahlstrom, 1938 (n. syn.)

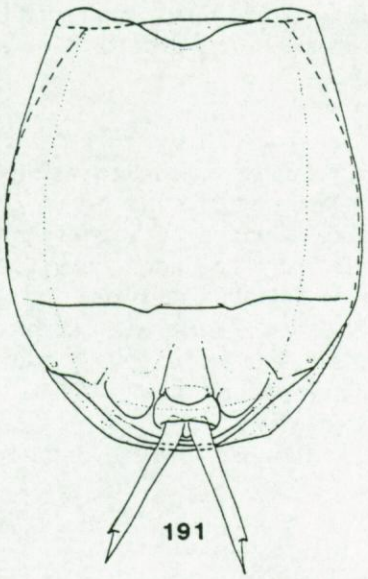
Murray 1913c p. 551 plate 22 figs 2a-d (*Cathypna papuana*); Harring 1914 p. 534 (*Lecane papuana*); Harring & Myers 1926 p. 336-337 plate 14 figs 3, 4; Ahlstrom 1938 p. 97-98 plate 7 fig. 1 (*L. luna* var. *presumpta*); Novotná-Dvorakova 1962 p. 175 fig. 7a-c (*L. yamunensis*); Kutikova 1970 p. 446-448 fig. 598; Koste 1978 p. 225-226 plate 74 fig. 4a-c; Živković 1987 p. 13 fig. 77 (*L. presumpta*); Koste & Shiel 1990 p. 29 plate 13 fig. 4.

Type locality
New Guinea.

Differential diagnosis
L. papuana needs careful comparison with the following taxa:
- *L. elsa*, *L. braumi*: The lateral margins of the dorsal plate reach the head aperture, which is not the case in *L. elsa* or *L. braumi*. The ventral head aperture margin has lateral semicircular projections and a median sinus in *L. papuana*, and is broadly bilobate in *L. elsa* and *L. braumi*;

→

Figs 191-194: L. papuana, ventral view. 192-193: head aperture.
Figs 195-196: L. elsa, ventral view.
(191: after Segers *et al.*, 1992; 192-193: Er Hoi Lake, near Dali, Yunnan, China; 194: after Ahlstrom, 1938 (sub. *L. luna* var. *presumpta*); 195: (Syn)type (Hauer, 1931), 196: Rio Solimoës, Amazonas, Brazil).



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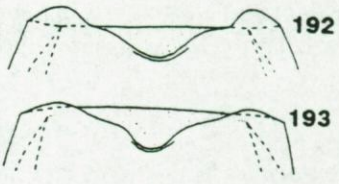

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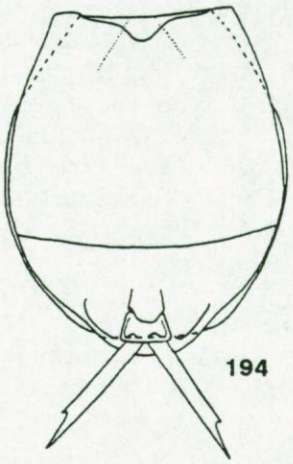
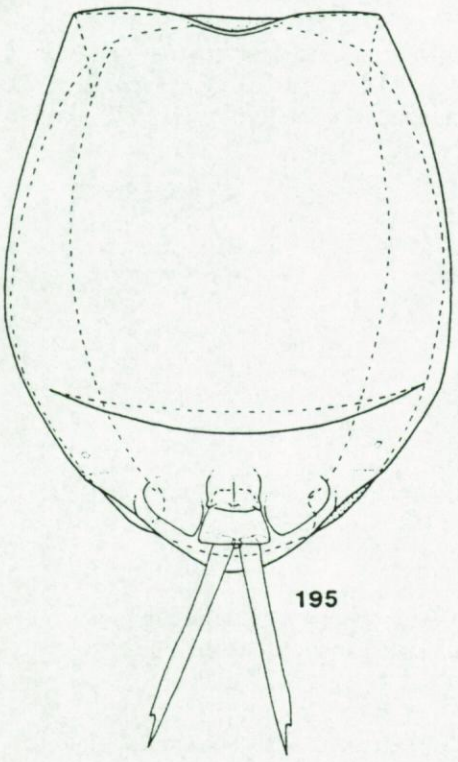


194

50 μm



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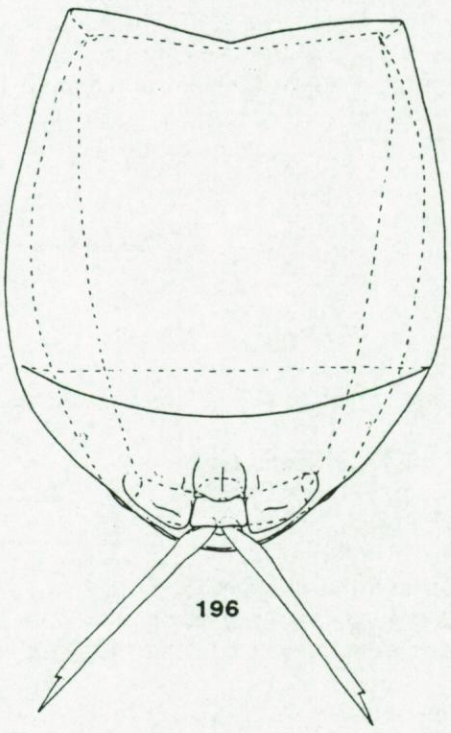

196

– *L. grandis* and some incompletely contracted *L. luna*: The ventral head aperture is as above in *L. papuana*, straight or smoothly concave in *L. grandis* or *L. luna*, respectively;

Description
Loricate *Lecane*. Dorsal plate anteriorly narrower, medially wider than ventral plate. Dorsal head aperture margin straight, ventral with lateral semicircular projections, a median sinus and intermediate straight parts. The lateral projections may or may not extend beyond the dorsal head aperture margin. Dorsal plate smooth, lateral edges reach head aperture. Ventral plate longer than wide, smooth. Transverse fold complete. Lateral margins smooth, nearly straight or curved. Lateral sulci deep. Foot plate broad, coxal plates rounded triangular. Prepedal fold broad, distally rounded. Foot pseudosegment trapezoidal, not projecting. Toes relatively short, parallel-sided, bearing needle-like pseudoclaws and small accessory claws.

Measurements: DPl. 92-120, DPw. 82-102, VPl. 104-125, VPw. 80-98, toe l. 26-40, claw l. 8-13.

Distribution
L. papuana is a warm-stenotherm, with a Pantropical and Pansubtropical distribution (see Edmondson & Hutchinson, 1934).

Comments
The original description of *L. luna* var. *presumpta* by Ahlstrom (1938: see fig. 194; subsequently listed as of subspecific or specific rank) is based on an imperfectly contracted *L. papuana*, with the projections of the ventral head aperture margin scarcely extending beyond the dorsal (compare fig. 192 and 193). Subsequent records of the var. *presumpta* concern *L. elsa* (e.g., Tarnogradski, 1961b; Kutikova, 1970; Živković, 1987), *L. papuana* or incompletely contracted *L. luna*.

45. *Lecane braumi* Koste, 1988
Figs 188-189

L. elsa after Segers *et al.* (1993a)

Koste 1988a p. 112-113 figs 11a, b; Segers & De Meester 1994 p. 119 fig. 20.

Type locality and types
Perian Lake, Sungai Mahakam, Eastern Kalimantan, Indonesia. Holotype in SMF, paratype in collection of W. Koste.

Differential diagnosis
L. braumi can easily be mistaken for *L. elsa*. The species has an incomplete transverse fold (complete, lunate in *L. elsa*) and relatively longer toes than *L. elsa*.

Description
Relatively large species. Lorica smooth. Dorsal plate narrower than ventral plate, lateral margins not reaching head aperture. Head aperture margin dorsally straight,

ventrally biconvex. Ventral plate longer than wide, transverse fold incomplete. Lateral margins smooth, curved. Lateral sulci deep. Foot plate broad, coxal plates rounded triangular. Prepedal fold broad, short, with smoothly rounded posterior margin. Foot pseudosegment trapezoidal, not projecting. Toes relatively long, parallel-sided, bearing pseudoclaws and accessory claws.

Measurements: DPl. 122-150, DPw. 122-135, VPl. 148-180, VPw. 132-156, toe l. 70-113, claw l. 10-12.

Distribution
Known from Indonesian Borneo, Papua New Guinea and Nigeria.

46. *Lecane elsa* Hauer, 1931
Figs 195-196

L. luna var. *presumpta* after Tarnogradski (1961a), *L. luna presumpta* after Kutikova (1970), *L. presumpta* after Živković (1987).

Hauer 1931 p. 8-9 figs 2a, b; Kutikova 1970 p. 446 fig. 605; Koste 1978 p. 226 plate 74 figs 5a-c, Martinez & José de Paggi 1988 p. 287-288 fig. 10a (partim); Koste & Shiel 1990 p. 20 plate 9 fig. 3.

Type locality and types
Near Karlsruhe, Germany. No type designated, apparent (syn)types in collection of RUG and PANS.

Differential diagnosis
The species resembles *L. curvicornis*, but has angulate antero-lateral corners. It differs from *L. grandis* and *L. papuana* by its broadly bilobate ventral head aperture margin, and from *L. braumi* by its complete, lunate transverse fold and its relatively shorter toes. The original diagnostic character, viz. the ventral head aperture margin projecting beyond the dorsal, is not always reliable.

Description
Relatively large species. Lorica smooth. Dorsal plate narrower than ventral plate, lateral margins not reaching head aperture. Head aperture margin dorsally straight, ventrally biconvex. Ventral plate longer than wide, with complete, lunate transverse fold. Lateral margins smooth, slightly curved. Lateral sulci deep. Foot plate broad, coxal plates rounded triangular. Prepedal fold broad, short, with smoothly rounded posterior margin. Foot pseudosegment trapezoidal, not projecting. Toes parallel-sided, bearing pseudoclaws and accessory claws.

Measurements: DPl. 122-140, DPw. 102-113, VPl. 133-160, VPw. 106-128, toe l. 53-68, claw l. 7-10.

Distribution
Probably cosmopolitan, in the littoral of temporary water bodies. Revision is needed, due to confusion with *L. braumi*.

47. *Lecane tenuiseta* Harring, 1914
Figure 197

Synonym: *L. punctata* Carlin-Nilsson, 1934 non (Murray, 1913a)

L. aeganea after Tarnogradski (1961b)

Harring 1914 p. 543-544 plate 22 figs 1-3; Harring & Myers 1926 p. 372-373 plate 31 figs 3, 4; Carlin-Nilsson 1934 p. 9 fig. 4 (*L. punctata* non (Murray, 1913a)); Tarnogradski 1961b p. 48-49 figs 44-46; Kutikova 1970 p. 450 fig. 611; p. 451 fig. 610 (*L. tenuiseta punctata*); Koste 1978 p. 218 plate 72 figs 7a, b, 12a, b; Koste & Shiel 1990 p. 34 plate 15 fig. 6.

Type locality and type
Kenilworth, D.C.; San Marcos, Texas, U.S.A.; Camacho Reservoir, Panama. Type in NMNH.

Differential diagnosis
L. tenuiseta is characterised by its long, completely separated claws. It can be confused with *L. inermis*, which is smaller and illoricate. *L. doryssa* has a stiffer, more strongly ornamented lorica and a more elongate, projecting foot pseudosegment.

Description
Lorica occasionally soft, though distinct. Dorsal plate anteriorly narrower, medially as wide as ventral plate, smooth. Head aperture margins nearly coincident or parallel, almost straight, at times irregular. Antero-lateral corners angulate. Ventral plate longer than wide, with incomplete transverse and longitudinal folds, smooth or ornamented. Lateral margins smooth, nearly straight. Lateral sulci deep. Foot plate broad, rounded posteriorly, coxal plates rounded. Prepedal fold narrow, elongate, distally with median projection. Foot pseudosegment not or slightly projecting. Toes parallel-sided, bearing completely separated, long claws.

Measurements: DPl. 56-78, DPw. 52-60, VPl. 57-83, VPw. 52-60, toe l. 20-24, claw l. 12-16.

Distribution
L. tenuiseta is one of the most common, eurytopic cosmopolitan Lecanidae.

48. *Lecane doryssa* Harring, 1914
Figs 12, 198-199

non *L. doryssa* after Kutikova (1970)

Harring 1914 p. 542-543 plate 21 figs 4-6; Harring & Myers 1926 p. 373-374 plate 31 figs 5, 6; Hauer 1938 p. 513-514 figs 38a, b; Koste 1978 p. 218 plate 72 figs 9a-c; Koste & Shiel 1990 p. 20 plate 9 fig. 2.

Type locality and type
Pool between Black Swamp and Gatun, Panama. Type in NMHM.

Differential diagnosis
This species can be confused with *L. tenuiseta*. It has a stiffer, more strongly ornamented and elongate lorica, and a characteristic, projecting foot pseudosegment.

Description
Lorica stiff. Dorsal plate anteriorly narrower, medially wider than ventral plate, strongly ornamented. Head aperture margins nearly coincident or parallel, straight or slightly convex. Antero-lateral corners angulate. Ventral plate slightly longer than wide, with incomplete transverse and longitudinal folds, ornamented. Lateral margins irregularly undulate, nearly parallel. Lateral sulci deep. Foot plate broad, with rounded triangular coxal plates. Prepedal fold narrow, elongate, posterior margin with median projection. Foot pseudosegment elongate, projecting, with lateral lobes. Toes relatively short, parallel-sided, with long, completely separated claws.

Measurements: DPl. 51-58, DPw. 51-60, VPl. 62-70, VPw. 58, ant. edge w. 46-56, toe l. 17-19, claw l. 11-13.

Distribution
Cosmotropical-cosmosubtropical, rare.

49. *Lecane sagula* Harring & Myers, 1926
Figs 206-207

non *L. sagula* after Tarnogradski (1961b)

Harring & Myers 1926 p. 365-366 plate 28 figs 3-4; Kutikova 1970 p. 451 fig. 612; Koste 1978 p. 216 plate 72 figs 4a, b; Zoppi de Roa *et al.* 1990 p. 33 fig. 5.

Type locality
Minocqua, Wisconsin; Mount Desert Island, Maine, U.S.A.

Differential diagnosis
L. sagula resembles *L. pusilla*, but is readily distinguished by its large, circular foot pseudosegment.

Description
Lorica stiff. Dorsal plate anteriorly narrower, medially wider than ventral plate, ornamented. Head aperture margins nearly coincident, straight, antero-lateral corners angulate. Ventral plate slightly longer than wide, with incomplete transverse and longitudinal folds, ornamented. Lateral margins irregularly undulate, nearly parallel-sided. Foot plate broad, rounded posteriorly, coxal plates rounded. Prepedal fold narrow, elongate, distally with median projection. Foot pseudosegment large, semicircular, projecting. Toes parallel-sided, with completely separated claws.

Measurements: DPl. 48, DPw. 45, VPl. 60, VPw. 45, toe l. 19, claw l. 4.

Distribution
Known from the type locality and from Venezuela.

50. *Lecane subtilis* Harring & Myers, 1926
Figs 202-203

Synonyms: *L. murrayi* Korde, 1927
L. apatinensis Živković, 1987 (n. syn.)

Harring & Myers 1926 p. 370-371 plate 30 figs 5, 6; Korde, 1927 p. 81 figs 8-9 (*L. murrayi*); Hauer 1929 p. 149 figs 5a, b; Tarnogradski 1961b p. 47 figs 34-39; Kutikova 1970 p. 450 fig. 608; Koste 1978 p. 217 plate 72 figs 11a-b; Živković 1987 p. 69-70 figs 67a-c (*L. apatinensis*); Koste & Shiel 1990 p. 33 plate 15 fig. 4.

Type locality and type
Arbor Vitae Lake, near Minocqua, Wisconsin, U.S.A. Paratype in PANS.

Differential diagnosis
L. subtilis can be confused with *L. pusilla*. *L. subtilis* has a distinctly projecting, squarish foot pseudosegment; a straight transverse ridge on the dorsal side of the foot plate and, mostly, longer toes than *L. pusilla*.

Description
Lorica stiff. Dorsal plate anteriorly narrower, medially as wide as ventral plate, ornamented. Head aperture margins coincident, straight or slightly convex. Anterolateral corners angulate. Ventral plate longer than wide, with incomplete transverse and longitudinal folds, ornamented. Lateral margins irregularly undulate, nearly straight or with anterior notches. Foot plate broad, rounded posteriorly, coxal plates rounded. Prepedal fold narrow, elongate, distally with median projection. Foot pseudosegment simple, projecting. Toes parallel-sided, bearing completely separated claws.

Measurements: DPl. 54-70, DPw. 50-60, VPl. 60-75, VPw. 50-55, anterior edge w. 56, toe l. 20-24, claw l. 5-8.

Distribution
L. subtilis is probably cosmopolitan. It is never found in high numbers, but is recorded from diverse types of water bodies.

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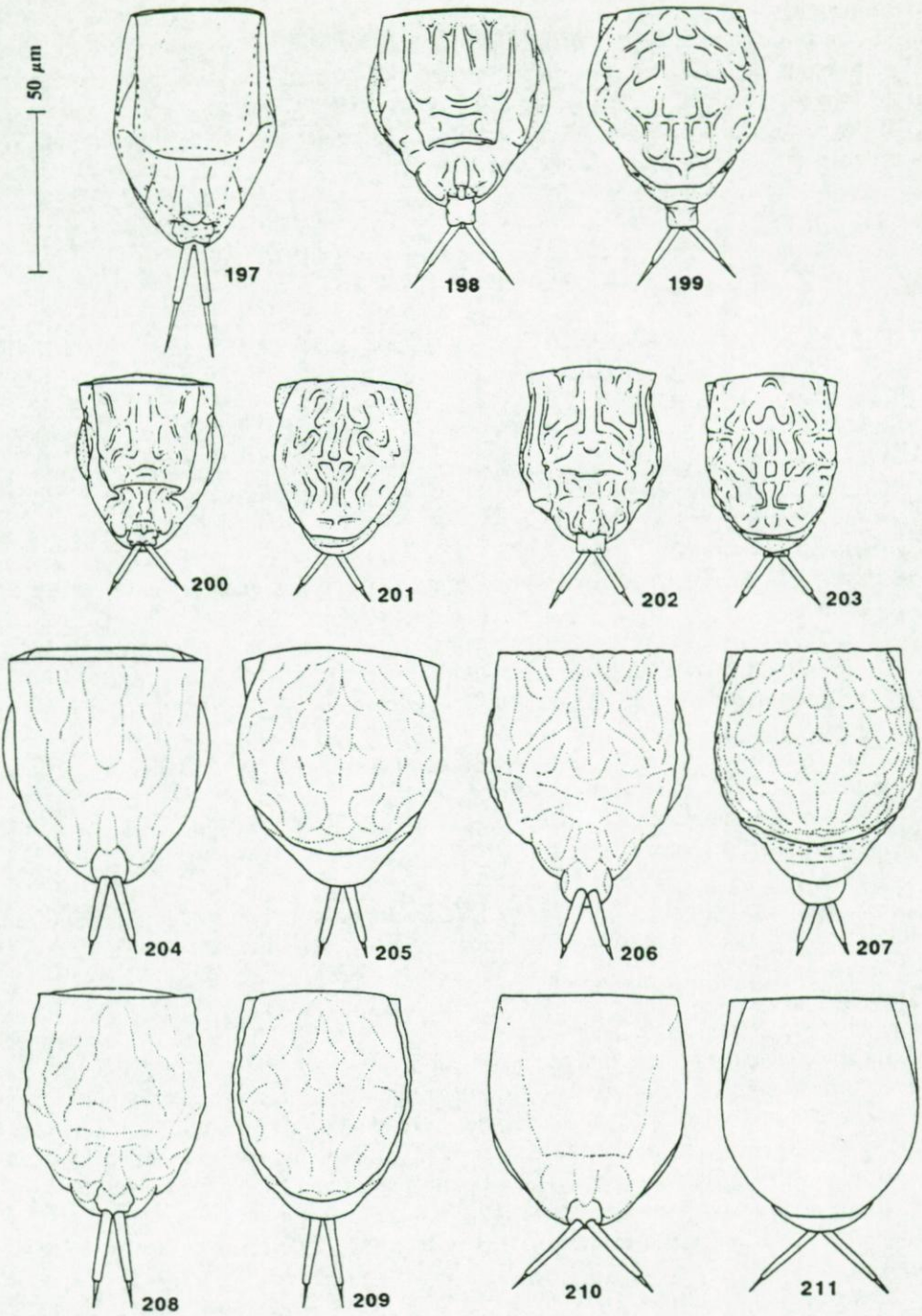
Fig. 197: L. tenuiseta, ventral view.
Figs 198-199: L. doryssa. 198: ventral view, 199: dorsal view.
Figs 200-201, 204-205: *L. pusilla*. 200, 204: ventral view, 201, 205: dorsal view.
Figs 202-203: L. subtilis. 202: ventral view, 202: dorsal view.
Figs 206-207: L. sagula. 206: ventral view, 207: dorsal view.
Figs 208-209: L. aeganea. 208: ventral view, 209: dorsal view.
Figs 210-211: L. formosa. 210: ventral view, 211: dorsal view.
(197: Easter Island (Segers & Dumont, 1993a); 198-199, 202-203: Maracá Island, Roraima, Brazil; 200-201: Nigeria (Segers *et al.*, 1993a); 204-211: after Harring & Myers, 1926).


50 µm
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Comments
The description of *L. apatinensis* differs from *L. subtilis* only in reporting a relatively more elongate lorica. As this character depends strongly on degree of contraction, the two are here considered synonyms. Živković (1987) did not provide a diagnosis of his new species versus *L. subtilis*, neither did he list this relatively common, cosmopolitan species from his study area.

51. *Lecane pusilla* Harring, 1914
Figs 200-201, 204-205.

Harring 1914 p. 541-542 plate 20 figs 4-6; Harring & Myers 1926 p. 369 plate 30 figs 1, 2; Kutikova 1970 p. 450 fig. 607; Koste 1978 p. 216 plate 72 figs 5a, b; Koste & Shiel 1990 p. 31 plate 14 fig. 1.

Type locality
Rio Grande, Empire, Panama.

Differential diagnosis
L. pusilla can easily be confused with *L. subtilis*. The two species differ in the following aspects:
- The foot pseudosegment is simple, occasionally with lateral projections in *L. pusilla*, distinctly rectangular in *L. subtilis*;
- The foot pseudosegment is scarcely projecting in *L. pusilla*, projecting in *L. subtilis*;
- The dorsum of the foot plate is smooth or bears a curved transverse ridge in *L. pusilla*, a straight transverse ridge in *L. subtilis*;
- The toes are shorter in *L. pusilla* (l. with claws: 20-27 µm) than in *L. subtilis* (l. with claws: 25-32 µm)

L. pusilla is closely related to *L. furcata*, *L. inopinata* and relatives, and differs from these only by its completely separate toes.

Description
Lorica stiff. Dorsal plate anteriorly narrower, medially wider than ventral plate, ornamented. Head aperture margins nearly coincident or parallel, straight, antero-lateral corners angulate. Ventral plate slightly longer than wide, with incomplete transverse and longitudinal folds, ornamented. Lateral margins smooth, nearly parallel-sided, occasionally irregularly folded or with anterior notches. Lateral sulci deep. Foot plate broad, rounded posteriorly, coxal plates rounded. Prepedal fold narrow, elongate, distally with median projection. Foot pseudosegment simple or with lateral lobes, not or slightly projecting. Toes parallel-sided, bearing completely separated claws.

Measurements: DPl. 54, DPw. 52-54, VPl. 60, VPw. 45-50, toe l. 15-21, claw l. 5-6.

Distribution
Insufficiently known. Probably an eurytopic cosmopolitan.

52. *Lecane aeganea* Harring, 1914
Figs 208-209

non *L. aeganea* after Fadeev (1924)

Harring 1914 p. 542 plate 21 figs 1-3; Harring & Myers 1926 p. 367 plate 27 figs 1, 2; Wiszniewski 1954 p. 71 (*L. tenuiseta aeganea*); Kutikova 1970 p. 450-451 fig. 609 (*L. tenuiseta aeganea*); Koste 1978 p. 217 plate 72 figs 8a, b (*L. aegana*); Segers & Dumont 1993b p. 15 figs 5a-b.

Type locality
Near Gatun, Panama.

Differential diagnosis
The species resembles *L. tenuiseta*, but has a stiffer, less elongate lorica and shorter claws.

Description
Lorica stiff. Dorsal plate narrower than ventral, ornamented or smooth. Dorsal and ventral head aperture margins straight, nearly coincident. Ventral plate slightly longer than wide, with incomplete transverse and longitudinal folds, ornamented or smooth. Lateral margins straight, smooth or irregularly folded, nearly parallel. Lateral sulci shallow. Foot plate as long as wide, with complicated pattern of folds. Coxal plates inconspicuous. Prepedal fold narrow, elongate, posteriorly with median projection. Foot pseudosegment hardly projecting, with lateral extensions. Toes parallel-sided, occasionally fused basally. Claws completely separated, straight.

Measurements: DPl. 72-76, DPw. 66-67, VPl. 79-82, VPw. 60-67, toe l. 24-25, claw l. 9.

Distribution
Due to the confusion of this species with *L. tenuiseta* by several authors, is it at present not possible to report on its area. Apparently, it is rare.

Note
L. formosa Harring & Myers, 1926 (Figs 210-211), described from Lac Vieux Desert, Wisconsin, U.S.A., differs only by its smooth lorica and by its foot pseudosegment being almost square.

Measurements: DPl. 74, DPw. 68, VPl. 80, VPw. 68, toe l. 25, claw l. 7.

53. *Lecane hastata* (Murray, 1913a)
Figs 212-213

Synonyms: *L. plesia* Myers, 1936b (n. syn.)
L. hegurensis Yamamoto, 1951
L. jana Abdullaev, 1989 (n. syn.)
L. namibiensis (Koste & Brain, 1993) (n. comb., n. syn.)

Murray 1913a p. 348-349 plate 14 figs 25a-d (*Cathypna hastata*); Harring & Myers 1926 p. 363-364 plate 28 figs 5, 6 (*Lecane hastata*); Myers 1936b p. 430 plate 53 fig. 35 (*L. plesia*); Yamamoto 1951 p. 158 figs 5-7 (*L. hegurensis*); Godenau 1961 p. 1206 figs 5a, b; Kutikova 1970 p. 445 fig. 595; p. 438 fig. 576 (*L. plesia*); Koste 1978 p. 233 plate 77 figs 4a-d, 6a-c; p. 234 plate 77 figs 1, 5a, b (*L. plesia*); Abdullaev 1989 p. 127-128 figs 3, 4 (*L. jana*); Koste & Shiel 1990 p. 23 plate 11 fig. 1; Koste & Brain *in* Brain & Koste 1993 p. 451-454 figs 4a, b, 5c-h (*Proales namibiensis* Koste & Brain, 1991).

Type locality
Lagoon near Botanical Gardens, Rio de Janeiro, Brazil.

Differential diagnosis
The species resembles *L. crepida*, but its lorica is broader and its claws are swollen at their basis. It differs from *L. climacois* by its dorsal plate being at most as wide as its ventral plate, and less elongate lorica.

Description
Soft-loricate *Lecane*. Dorsal plate narrower than ventral plate, smooth or with semi-longitudinal folds. Head aperture margins nearly coincident, straight, or dorsally slightly convex. Antero-lateral spines present. Ventral plate longer than wide, with complete transverse and longitudinal folds, smooth or ornamented. Lateral margins smooth, straight or slightly curved. Lateral sulci shallow. Foot plate wide, with rounded triangular coxal plates. Prepedal fold relatively broad, distally with median projection. Foot pseudosegment nearly square, not or distinctly projecting. Toes parallel-sided. Claws long, completely separated, with basal swelling.

Measurements: DPl. 74-97, DPw. 50-79, VPl. 84-115, VPw. 62-90, toe l. 24-41, claw l. 14-21.

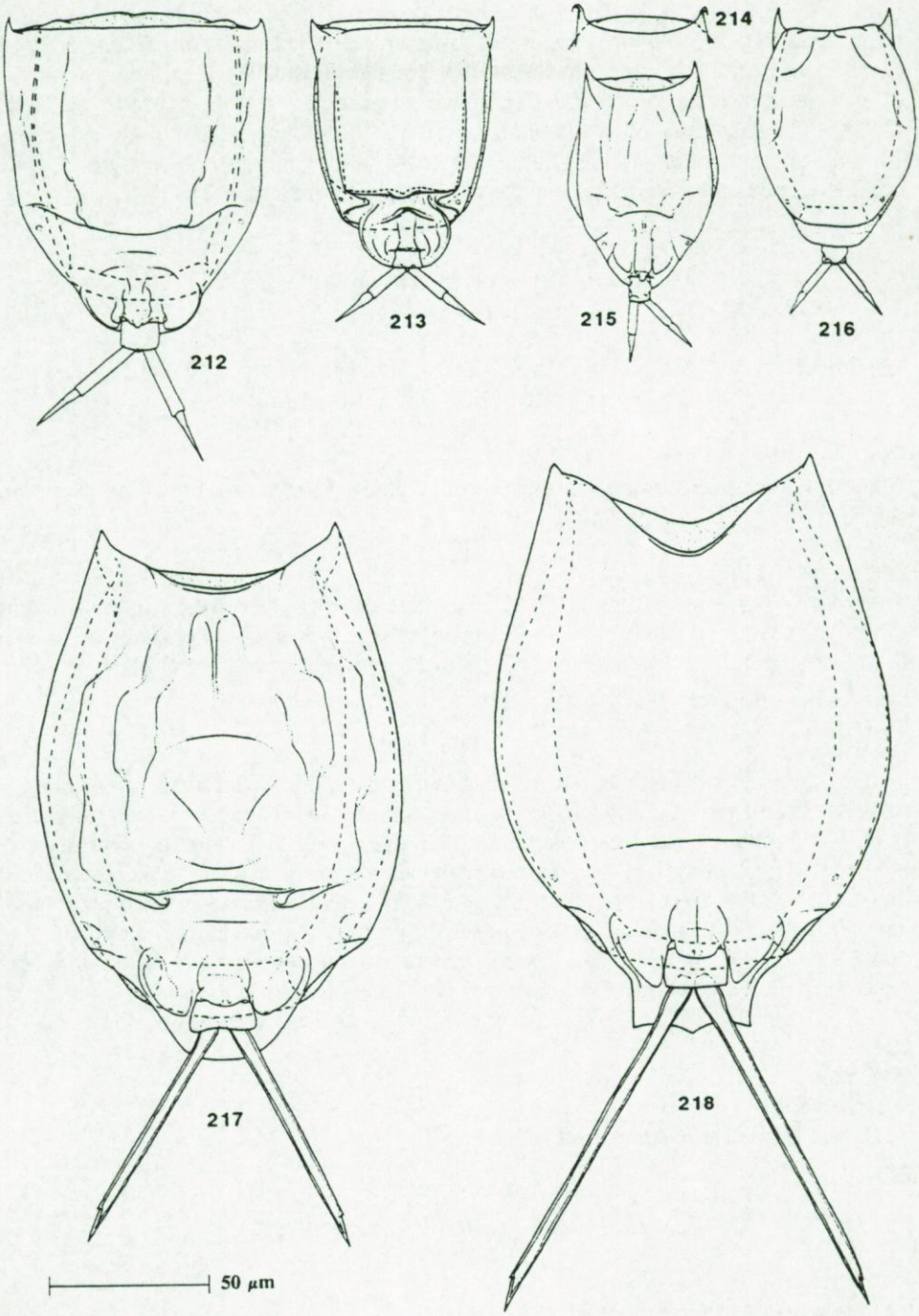
Distribution
Cosmopolitan in saline and freshwater. Relatively common.

Comments
The lorica stiffness of *L. hastata* is variable. Consequently, a variability in shape due to differences in degree of contraction, as illustrated in Figs 212-213 can be observed. *L. plesia* is here considered to be a strongly contracted animal, as in fig. 213, and is therefore synonymised, as suggested by Koste (1978: '... Möglicherweise ein juv. Stadium von *L. hastata*!'). The holotype of *L. jana*, deposited in the Museum of the Moscow University (examined), is an incompletely contracted *L. hastata*.

The examination of specimens from the 'type sample' of *Proales namibiensis*, kindly provided by Dr C.K. Brain, revealed that the taxon does not belong to *Proales*,

→

Figs 212-213: L. hastata, ventral view.
Figs 214-216: L. climacois. 214, 215: ventral view, 214: head aperture. 216: dorsal view.
Figs 217-218: L. leontina, ventral view.
(212: Yuangshuo, near Guilin, Zizhiqu province, China; 213: Namibia ('topotype' of *Proales namibiensis*, see Brain & Koste, 1993); 214-216: after Segers, 1993; 217-218: Nigeria (Segers *et al.*, 1993a)).


212
213
214
215
216
217
218
50 µm

but is a *Lecane*, and is conspecific with *L. hastata*. The short and board-shaped fulcrum, recorded in *P. namibiensis* is not different from that in *Lecane* (incorrectly reported 'comparatively long' in *Lecane* by Brain & Koste, 1993: compare with figs 35-61), its foot is as in any non-contracted *Lecane* (see fig. 4a in Brain & Koste, 1993!). The manubria of *P. namibiensis* have the elongated lamellae, typical of *Lecane*. The material examined contains mostly badly contracted *L. hastata*. A well-contracted specimen from this material is represented in figure 213.

54. *Lecane climacois* Harring & Myers, 1926
Figs 214-216

Harring & Myers 1926 p. 358 plate 25 figs 1, 2; Koste 1978 p. 230 plate 75 figs 10a, b (*L. stichaea* var. *climacois*); Segers 1993 p. 53 figs 11a-c.

Type locality
Glenburnie, near Baltimore, Maryland; Polk County, Florida; Atlantic City, New Jersey, U.S.A.

Differential diagnosis
The species resembles a small *L. hastata*. It is distinguished by its more elongate lorica, relatively longer antero-lateral spines, shorter toes and by the shape of its foot pseudosegment. *L. climacois* has a medially wider dorsal than ventral plate, which is not the case in *L. hastata*.

Description
Lorica stiff. Dorsal plate anteriorly narrower, medially wider than ventral plate, weakly ornamented. Head aperture margin dorsally nearly straight, ventrally concave, with conspicuous antero-lateral spines, these may be recurved. Ventral plate elongate, with incomplete transverse and weak longitudinal folds, smooth. Lateral margins slightly curved, smooth, nearly parallel. Lateral sulci deep. Foot plate elongate. Prepedal fold narrow, elongate, posterior margin with median projection. Coxal plates rounded triangular. Foot pseudosegment projecting, elongate, with lateral extensions. Toes parallel-sided, relatively short. Claws with basal swelling.

Measurements: DPl. 44-64, DPw. 43-56, VPl. 52-70, VPw. 39-49, toe l. 13-15, claw l. 7-9.

Distribution
Recorded from North America and Nigeria.

55. *Lecane leontina* (Turner, 1892)
Figs 217-220

Synonyms: *L. scutaria* (Stokes, 1897)
L. macrodactyla (Daday, 1898)
L. leontina bisinuata (Daday, 1905)
L. incisa (Daday, 1905) non (Daday)

L. biloba (Daday, 1905)
L. thomassoni Wulfert, 1965

Turner 1892 p. 61 plate 1 fig. 12 (*Cathypna leontina*); Stokes 1897 p. 631 plate 14 fig. 7 (*Cathypna scutaria*); Daday 1898 p. 15 fig. 3 (*Cathypna macrodactyla*); Daday 1905 p. 109 plate 6 fig. 18 (*C. leontina bisinuata*); p. 111 plate 6 fig. 14 (*Cathypna insica* non (Daday, 1897)); p. 111 plate 6 fig. 17 (*Cathypna biloba*); Murray 1913a p. 345-346 plate 13 figs 21a-c; Harring 1913a p. 61 (*Lecane leontina*); Harring & Myers 1926 p. 326-327 plate 10 figs 3-5; Hauer 1938 p. 516-517 figs 40a, b; Kertész 1955 p. 248 figs 3, 4; Wulfert 1965 p. 359-360 figs 8a-c (*L. thomassoni*); Kutikova 1970 p. 436 fig. 571; Koste 1978 p. 234 plate 77 figs 7a-h; p. 235 plate 77 figs 8a-c (*L. leontina thomassoni*); De Ridder 1981 p. 70-71 plate 3 fig. 14; Koste & Shiel 1990 p. 25 plate 11 fig. 4.

Differential diagnosis
The lorica shape of *L. leontina*, with its deeply concave anterior margins, peculiar posterior projection and relatively long, slender toes bearing pseudoclaws makes the species easily recognisable. It can hardly be confused with any congener.

Description
Loricate *Lecane*. Dorsal plate narrower than ventral plate. Head aperture margins strongly concave. Antero-lateral spines present, occasionally angulate or with long spines. Dorsal plate smooth or ornamented, lateral edges come close to or reach head aperture. Ventral plate elongate, occasionally ornamented. Transverse fold incomplete. Lateral margins smooth, curved. Lateral sulci deep. Foot plate broad, coxal plates rounded triangular, a variable posterior projection present. Prepedal fold broad, posterior margin rounded. Foot pseudosegment trapezoidal, non projecting. Toes long, parallel-sided, bearing incompletely separated, needle-like pseudoclaws. Accessory claws present.

Measurements: DPl. 100-170, DPw. 76-147, VPl. 120-240, VPw. 81-152, toe l. 70-139, claw l. 10-15.

Distribution
L. leontina is a warm-stenotherm, common in the tropics and subtropics.

Comments
The intraspecific variability of *L. leontina* is high, especially in the following aspects:
1) The posterior projection can be truncate or bear pointed or elongate postero-lateral spines; a median sharp projection can be present or absent (Figs 217, 220).
2) The shape of the head aperture varies, probably depending on small intraspecific differences but also on the degree of contraction of the specimens (compare Figs 218 and 219).
3) The lorica is mostly smooth, but strongly ornamented specimens can be found (e.g., fig. 217).
A revision of the taxonomic significance of these variants is, however, needed.

56. *Lecane ungulata* (Gosse, 1887)
Figs 34-36, 221

Synonyms: *L. glandulosa* (Stokes, 1897)
L. magna (Stenroos, 1898)
L. magna tenuior (Stenroos, 1898)
L. magna (Lucks, 1912) non (Stenroos, 1898)
L. sverigis Ahlstrom, 1934
L. donneriana Dhanapathi, 1976a (n. syn.)
L. fracida Bērziņš, 1982b
L. ungulata australiensis Koste & Shiel, 1990

L. minnesotensis after Murray (1913a)

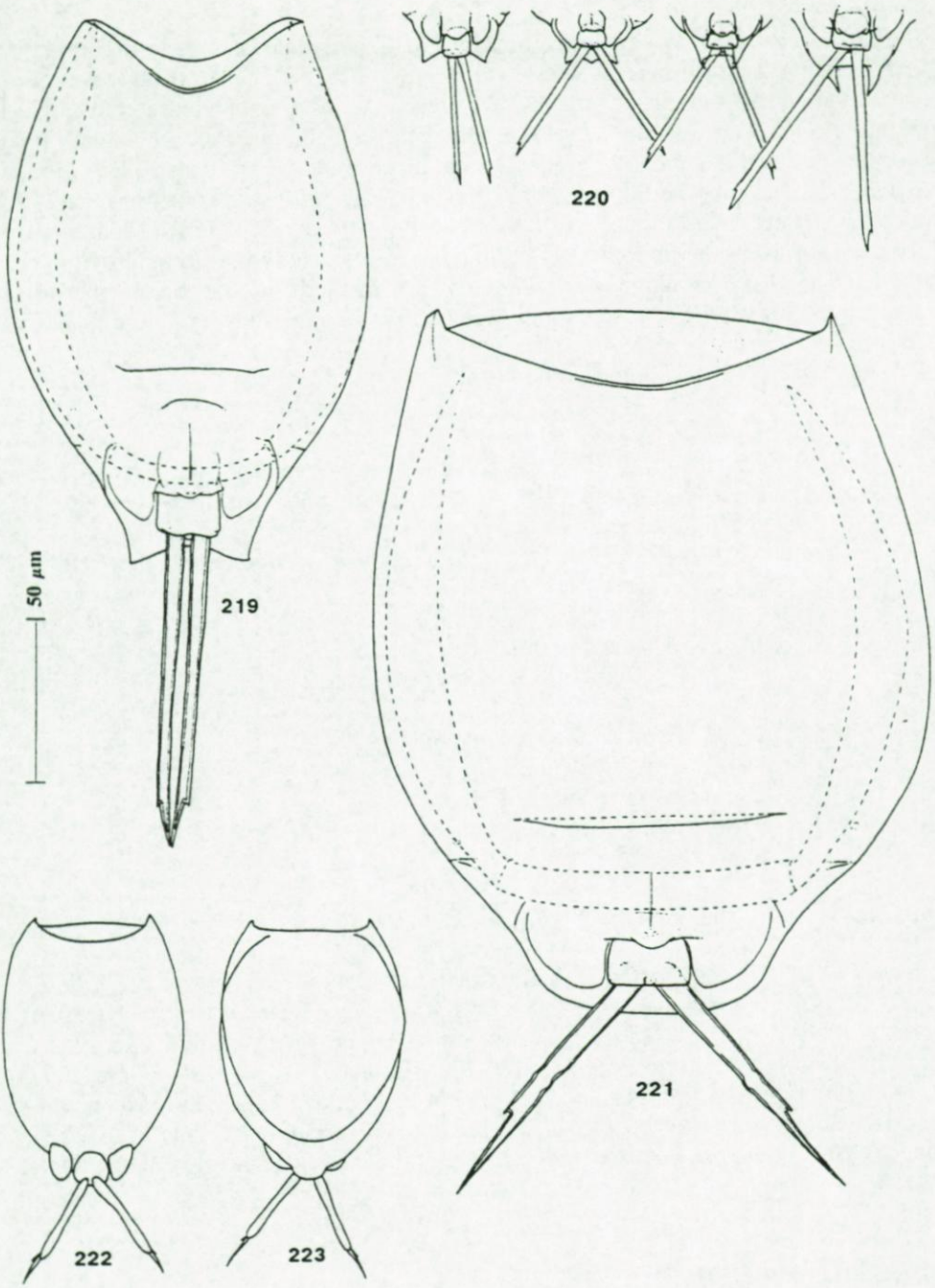
Gosse, 1887b p. 361 plate 8 fig. 1 (*Cathypna ungulata*); Stokes 1897 p. 632 plate 14 figs 8-10 (*Cathypna glandulosa*); Stenroos 1898 p. 161 plate 2 fig. 21 (*Cathypna magna*); p. 161 plate 2 fig. 22 (*C. magna tenuior*); Lucks 1912 p. 109 fig. 32 (*Cathypna magna* non Stenroos); Sachse *in* Brauer 1912 p. 173 (*C. ungulata* var. *magna*); Harring 1913a p. 62 (*Lecane ungulata*); Harring & Myers 1926 p. 323 plate 9 figs 3, 4; Ahlstrom 1934 p. 259 plate 25 figs 7, 8 (*L. sverigis*); Hauer 1938 p. 526-527; Wulfert 1966 p. 83 figs 39a-d; Kutikova 1970 p. 439-440 fig. 580; p. 448-449 fig. 601 (*L. magna* (Stenroos)); Dhanapathi 1976a p. 11 plate 1 figs 1, 2; p. 11-12 plate 1 figs 3, 4 (*L. donnerianus*); Koste 1978 p. 225 plate 74 figs 6a-g (incl. f. *magna* (Stenroos)); Koste 1979 p. 248-249 fig. 24a (var. *australiensis*); fig. 24b; Bērziņš 1982b p. 11-12 fig. 30 (*L. fracida*); Koste & Shiel 1990 p. 34 plate 16 figs 2a, b; fig. 2c (*L. ungulata australiensis* Koste, 1979); Segers 1992 p. 359.

Differential diagnosis
L. ungulata is unmistakable by its differentiated, truncate posterior end of foot plate as well as by its long claws. It is the largest species of the genus. It resembles most *L. curvicornis*, but has much longer claws, and relatively shorter toes.

Description
Loricate *Lecane*. Dorsal plate as wide as, or narrower than ventral plate. Head aperture margin dorsally and ventrally concave, straight or dorsally slightly convex. Antero-lateral spines present. Dorsal plate smooth, occasionally with median dome anteriorly. Lateral edges do not reach the head aperture. Ventral plate longer than wide, occasionally ornamented. Transverse fold incomplete. Lateral margins slightly curved, smooth. Lateral sulci deep. Foot plate broad, truncate posteriorly, coxal plates rounded triangular. Prepedal fold broad, rounded distally. Foot pseudosegment trapezoidal, mostly non-projecting. Toes parallel-sided, commonly with local constrictions. Long, incompletely separated pseudoclaws and accessory claws present.

Measurements: DPl. 140-260, DPw. 138-230, VPl. 185-300, VPw. 139-230, toe l. 48-90, claw l. 20-50.

Distribution
L. ungulata is a rather common littoral/periphytic species. It is a cosmopolitan.



Figs 219-220: *L. leontina*, ventral view. 220: foot plate and toes, several specimens.
Fig. 221: L. ungulata, ventral view (small specimen).
Figs 222-223: L. tabulifera. 222: ventral view, 223: dorsal view.
(219-220: Nigeria (Segers *et al.*, 1993a); 221: pond near Lake Glubokoe, Russia; 222-223: after Edmondson, 1936).

Comments
The large and relatively soft lorica and toes of *L. ungulata* are easily deformed or folded during contraction (e.g., *L. fracida* Bērziņš, 1982b). The dome on the anterior part of the dorsal plate may or may not be present, depending on contraction and has therefore no diagnostic value. *L. sibina* may be a small *L. ungulata*, by having long pseudoclaws and a generally similar lorica shape, but is here considered *species inquirenda*. The subspecific status of *L. ungulata australiensis* Koste & Shiel, 1990 (erroneously attributed to Koste (1979), but originally described, after 1961, explicitly as of infrasubspecific rank) is rejected, based on a study of specimens from the original sample. The diagnostic character (ornamented anterior dome on dorsal plate) is an artifact, the ornamentation appears to be an individual variation in a local strain.

L. donnerianus is a *L. ungulata* with transversely folded toes.

Note
L. tabulifera Edmondson, 1936 (Figs 222-223), described from the Pennamaquan Stream, Maine, U.S.A., appears to be close to *L. ungulata* (or *L. curvicornis*), but cannot be placed satisfactorily.

Measurements: DPl. 176, DPw. 148, VPl. 192, VPw. 148, toe l. 80, claw l. 20.

57. *Lecane luna* (O.F. Müller, 1776)
Figs 1, 14, 26-27, 224-225, 512

Synonyms: *L. jobloti* (Bory de St. Vincent, 1827)
L. emarginata (Eichwald, 1847)
L. luna balatonica Varga, 1945 (n. syn.)
L. submagna De Ridder, 1960
L. dorsicalis Arora, 1965

Infrasubspecific taxon: var. *intermedia* Bērziņš (1982b).

Müller 1776 p. 280 (*Cercaria luna*); Bory de St. Vincent p. 425 (*Furcularia jobloti*); Eichwald 1847 p. 348 plate 9 figs 7a, b (*Euchlanis emarginata*); Harring 1913a p. 61 (*Lecane luna*); Harring & Myers 1926 p. 334-336 plate 14 figs 5, 6; Varga 1945 p. 71, 98 figs 14a, b (*L. luna balatonica*); De Ridder 1960 p. 175-177 fig. 5 (*L. submagna*); Arora 1965 p. 449 figs 2a, b (*L. dorsicalis*); de Beauchamp 1965 p. 1268 figs 1052a-d; Nayar 1968 p. 176-177; Kutikova 1970 p. 438-439 figs 572-574 (*L. luna*; *L. luna balatonica*); Koste 1978 p. 223-224 plate 74 figs 1a-h, 3, plate 85 figs 8-11 (var. *presumpta*, var. *balatonica*); Koste & Shiel 1990 p. 27 plate 12 fig. 3; De Ridder 1991 p. 478.

Differential diagnosis
L. luna can be confused with *L. lateralis* or *L. rhenana*. The presence of broad antero-lateral spines and a concave head aperture margins characterise the species. It differs from *L. curvicornis* by the lateral margins of its dorsal plate reaching the head aperture, and by its stouter toes.

Description

Loricate *Lecane*. Dorsal plate narrower than ventral plate. Head aperture margin ventrally and dorsally concave, antero-lateral corners with broad-based spines. Dorsal plate smooth, nearly circular in well-contracted animals, occasionally with anterior dome. Lateral margins reach head aperture. Ventral plate longer than wide, smooth. Transverse fold complete. Lateral margins smooth, strongly curved. Lateral sulci deep. Foot plate broad, coxal plates rounded triangular. Prepedal fold broad, short, distally with rounded margin. Foot pseudosegment trapezoidal, not projecting. Toes relatively short, parallel-sided, bearing incompletely separated, needle-like pseudoclaws and accessory claws. Male: Figure 512 (see de Beauchamp, 1965).

Measurements: DPl. 90-162, DPw. 85-150, VPl. 95-177, VPw. 80-150, toe l. 36-55, claw l. 8-11.

Distribution

Cosmopolitan, eurytopic. *L. luna* is one of the commonest species of the genus.

Comments

The shape of the head aperture can change drastically depending on the degree of contraction. In well-contracted animals, both dorsal and ventral anterior margins are deeply concave and the lorica nearly circular. In such cases, the anterior of the dorsal plate can have a central dome. The anterior margins can be nearly straight (e.g., var. *presumpta* after some authors, see *L. papuana*), the lorica can be elongate (e.g., *L. submagna*: see De Ridder, 1991; *L. luna balatonica* after Ovander, 1980a). Such variants cannot be ascribed any taxonomic value, as they represent artifacts. The irregularity of the lorica in *L. luna balatonica*, indicating that it may represent an artifact, supports the synonymy of this 'subspecies' with *L. luna*.

58. *Lecane curvicornis* (Murray, 1913a)

Figs 4, 28, 226-233

Synonyms: *L. nitida* (Murray, 1913a) Harring, 1914
L. lofuana (Murray, 1913c) Harring, 1914
L. acronycha Harring & Myers, 1926
L. zwaiensis Bryce, 1931 (n. syn.)
L. bondi Edmondson, 1934 (n. syn.)
L. triloba Yamamoto, 1951 (n. syn.)
L. chankensis Bogoslovsky, 1958 (n. syn.)
L. tesselata Arora, 1965 (n. syn.)
L. curvilinealis Arora, 1965 (n. syn.)
L. longidactyla Arora, 1965 non (Edmondson, 1948)

Infrasubspecific taxa: var. *miamiensis* Myers, 1941; var. *padespares* Arora, 1965

Murray 1913a p. 346-347 plate 14 fig. 22 (*Cathypna curvicornis*); p. 347-348 plate 14 figs 24a, b (*Cathypna nitida*); Murray 1913c p. 551 plate 22 fig. 1 (*Cathypna lofuana*); Harring 1914 p. 535-534 plate 17 fig. 3 (*Lecane curvicornis*); Harring & Myers 1926 p. 321-322 plate 8 figs 1, 2; p. 322-323 plate 8 figs 3, 4 (*Lecane*

acronycha); Bryce 1931 p. 875-876 plate 1 figs 1, 2 (*L. zwaiensis*); Hauer 1931 p. 9-10 figs 3a, b; Edmondson 1934 p. 466-467 fig. 1 (*Lecane bondi*); Hauer 1938 p. 513 figs 37a, b (*L. curvicornis nitida*); Myers 1941 p. 2-4 figs 1, 2 (var. *miamiensis*); Yamamoto 1951 p. 160-161 fig. 8 (*Lecane triloba*); Bogoslovsky 1958 p. 624 fig. 2a, b (*Lecane chankensis*); Bērziņš 1959 p. 928 figs 13, 14 (*L. ungulata curvicornis*); Arora 1965 p. 448 figs 1a, b (var. *padespares*); p. 449-450 fig. 3 (*L. tesselata*); p. 450-451 fig. 4 (*L. curvilinealis*); p. 452 fig. 5 (*L. longidactylus*); Hauer 1965b p. 358 fig. 15; Kutikova 1970 p. 440-441 fig. 582; p. 441-442 fig. 583 (*L. acronycha*); p. 442 fig. 581 (*L. chankensis*); Koste 1978 p. 224 plate 74 fig. 2e; figs 2a, b (f. *lofuana*); figs 2c, d (*L. curvicornis nitida*); p. 225 plate 74 figs 7a, b (*L. acronycha*); De Ridder 1981 p. 75 plate 4 figs 5, 6; Martinez & José de Paggi 1988 p. 285-287 figs 9a-m; p. 287-289 figs 10b, c (sub. *L. elsa*); Koste & Shiel 1990 p. 16-18 plate 7 fig. 5 (*L. acronycha*); p. 20 plate 9 fig. 1; p. 27-29 plate 12 fig. 7 (*L. nitida*); Segers 1993 p. 52.

Type locality
Pond in Praca Republica, Rio de Janeiro, Brazil.

Differential diagnosis
The species is close to *L. elsa* and *L. ungulata*. It differs from *L. elsa* by the presence of antero-lateral spines, from *L. ungulata* by its relatively smaller size and shorter claws.

Description
Loricate *Lecane*. Dorsal plate narrower than ventral plate. Shape of head aperture variable: ventral and/or dorsal margins broadly V- or U- shaped, straight or slightly convex, occasionally biconvex ventrally, sometimes with folds. Antero-lateral spines present. Dorsal plate smooth or ornamented, lateral edges do not reach the head aperture. Ventral plate longer than wide or elongate, occasionally ornamented. Transverse fold complete. Lateral margins slightly curved, smooth. Lateral sulci deep. Foot plate broad, coxal plates rounded triangular, occasionally projecting. Prepedal fold broad, short, with smoothly rounded posterior margin. Foot pseudosegment trapezoidal, not projecting. Toes long, parallel-sided. Pseudoclaws and accessory claws present.

Measurements: DPl. 110-162, DPw. 86-136, VPl. 113-182, VPw. 95-124, toe l. 48-90, claw l. 6-13 (up to 17).

Distribution
A relatively common, cosmopolitan species. It is more frequent in warmer waters.

Comments
The intraspecific variability exhibited by this species is high, especially concerning the shape of the head aperture, of the caudal edge of the dorsal plate and of the foot

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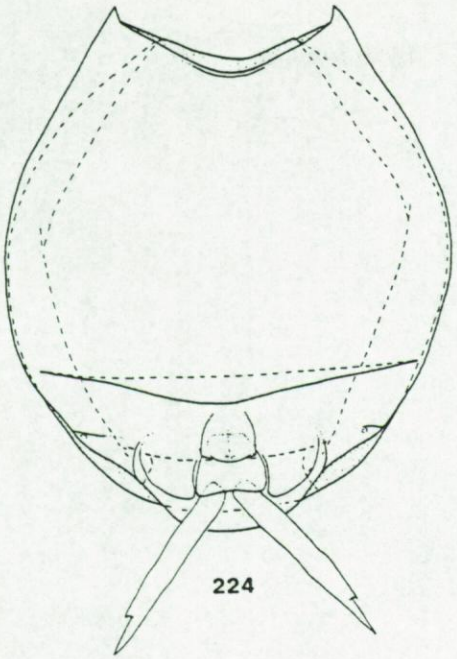
Figs 224-225: *L. luna*, ventral view.
Figs 226-228: L. curvicornis. 226: dorsal view, 227-228: ventral view. 227: head aperture.
(224: Er Hoi Lake, near Dali, Yunnan, China; 225: Nigeria (Segers *et al.*, 1993a); 226-228: Maracá Island, Roraima, Brazil).



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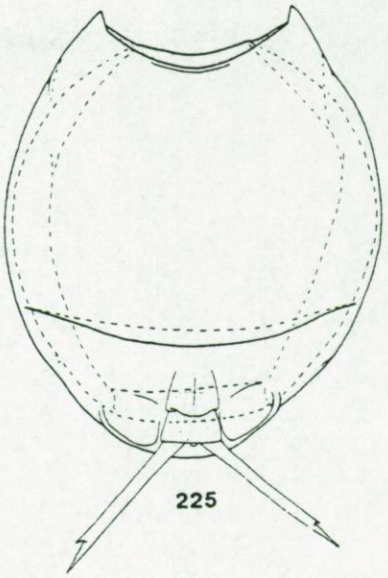

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50 µm

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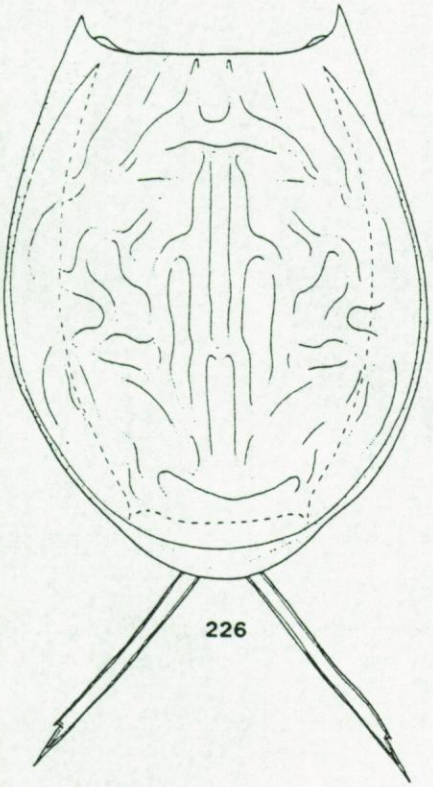

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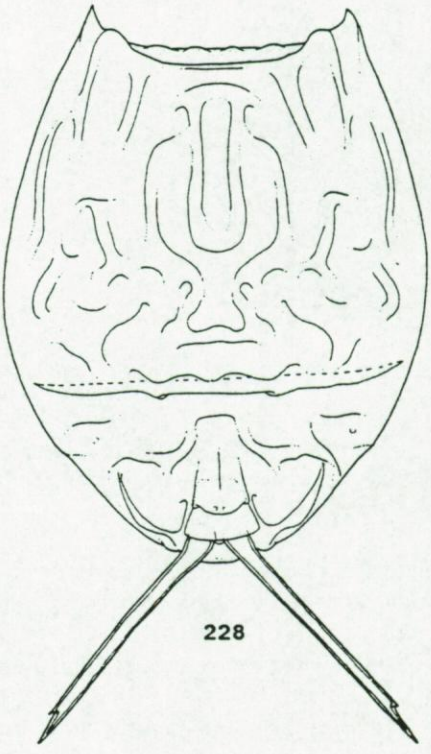

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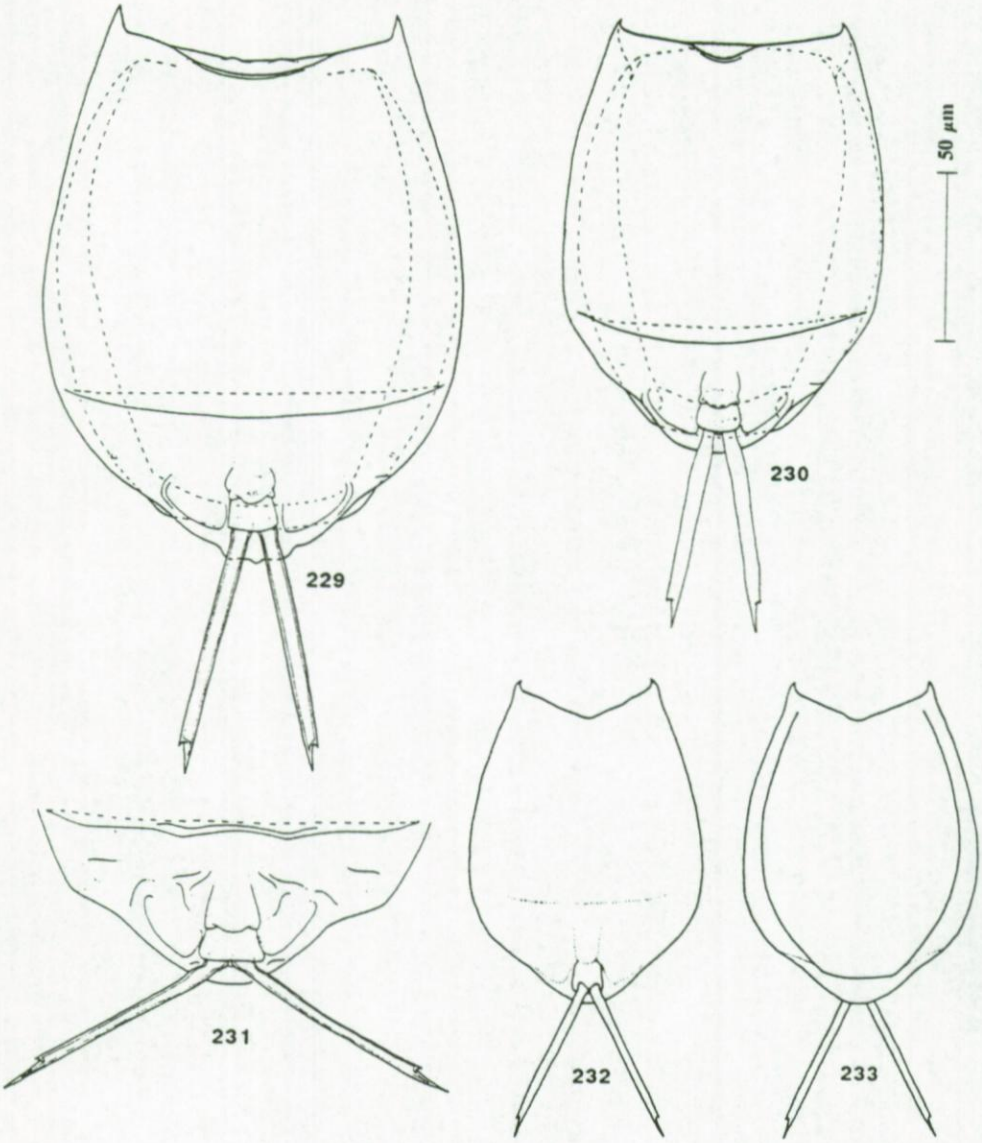

Figs 229-233: L. curvicornis. 229-232: ventral view, 231: foot region and toes, 233: dorsal view. (229-230: Nigeria (Segers *et al.*, 1993a); 231: Maracá Island, Roraima, Brazil; 232-233: after Harring & Myers, 1926).

plate. This has resulted in the description of a large number of related taxa and of frequent changes of their taxonomic rank (see above). They are here treated as synonyms.

Some of the more frequent, easily recognisable variants are the following.

- f. *acronycha*: dorsal and ventral anterior margins slightly concave (normally broadly V- shaped);

– f. *lofuana*: as f. *acronycha*, but lorica ornamented, posterior end of lorica trilobate;
– f. *nitida*: dorsal and ventral plates strongly ornamented.

Intermediates between these, as well as specimens with deviating morphology, occur frequently.

Note
the var. *rigida*, contributed to Murray by Voigt (1957) may be a lapsus.

59. *Lecane rhenana* Hauer, 1929
Figs 234-236

Hauer 1929 p. 145-146 figs 1a, b; Kutikova 1970 p. 444 fig. 592; Koste 1978 p. 226 plate 75 fig. 2a-b; Koste 1988a p. 117-118 fig. 20.

Type locality
Near Karlsruhe-Daxlanden, F.R.G.

Differential diagnosis
L. rhenana resembles a small *L. luna* or *L. curvicornis*. It differs from these by its nearly straight head aperture margins, relatively short toes and small size. *L. rhenana* appears closely related to *L. papuana*, but the two species can not be confused.

Description
Loricate *Lecane*. Dorsal plate medially as wide as, or slightly wider than the ventral plate, anteriorly narrower. Head aperture margin ventrally straight or slightly concave, straight or slightly convex dorsally. Triangular antero-lateral spines present. Dorsal plate smooth, nearly circular. Ventral plate longer than wide, smooth, transverse fold complete. Lateral margins smooth, curved. Lateral sulci deep. Foot plate broad, coxal plates rounded. Prepedal fold broad, distal margin rounded. Foot pseudosegment trapezoidal, not projecting. Toes short, parallel-sided, bearing incompletely separated pseudoclaws and accessory claws.

Measurements: DPl. 85-117, DPw. 75-115, VPl. 95-140, VPw. 80-111, toe l. 35-40, claw l. 8

Distribution
Insufficiently known. The species may have been overlooked, and be cosmopolitan. It has been recorded from Germany, Indonesia, Thailand and South America.

Comments
The taxonomy of this species is confused. The present description deviates from the original, in that the lateral margins of the dorsal plate are originally not reported to reach the head aperture margins.

A synspecificity of *L. sibina* and *L. rhenana*, as proposed by Koste (1978), who, in such case incorrectly gives priority to the second name, is unlikely.

60. *Lecane infula* Harring & Myers, 1926
Figs 240-241

Harring & Myers 1926 p. 361-362 plate 26 figs 5, 6; Fadeev 1927 p. 148-149 plate 1 fig. 11; Yamamoto 1960 p. 392 fig. 7d; Kutikova 1970 p. 439 fig. 577.

Type locality
Lower Breakneck Pond, Mount Desert Island, Maine, U.S.A.

Differential diagnosis
The species is reminiscent of *L. stichaea* or *L. flexilis*, but is easily recognised by its characteristic ornamented lorica.

Description
Loricate *Lecane*. Dorsal plate anteriorly narrower, medially wider than ventral plate, characteristically ornamented. Head aperture margins nearly coincident, slightly concave, with antero-lateral spines. Ventral plate elongate, with complete transverse and longitudinal folds, ornamented. Lateral margins irregularly undulate, slightly curved. Lateral sulci shallow. Foot plate wide. Prepedal fold narrow, elongate, distally with median projection. Foot pseudosegment elongate, widest distally, not projecting. Toes parallel-sided, bearing incompletely separated claws.

Measurements: DPl. 90-105, DPw. 70-80, VPl. 95-120, VPw. 55-65, toe l. 32-40, claw l. 5-6.

Distribution
The species is rare, and apparently Holarctic.

61. *Lecane flexilis* (Gosse, 1886)
Figs 237-239

Synonyms: *L. lipara* (Gosse, 1887)
L. brevis (Murray, 1913c) Voigt, 1957
L. compta Harring, 1914
?*L. glypta* Harring & Myers, 1926

Infrasubspecific taxon: *L. glypta* f. *nuda* Russell, 1956.

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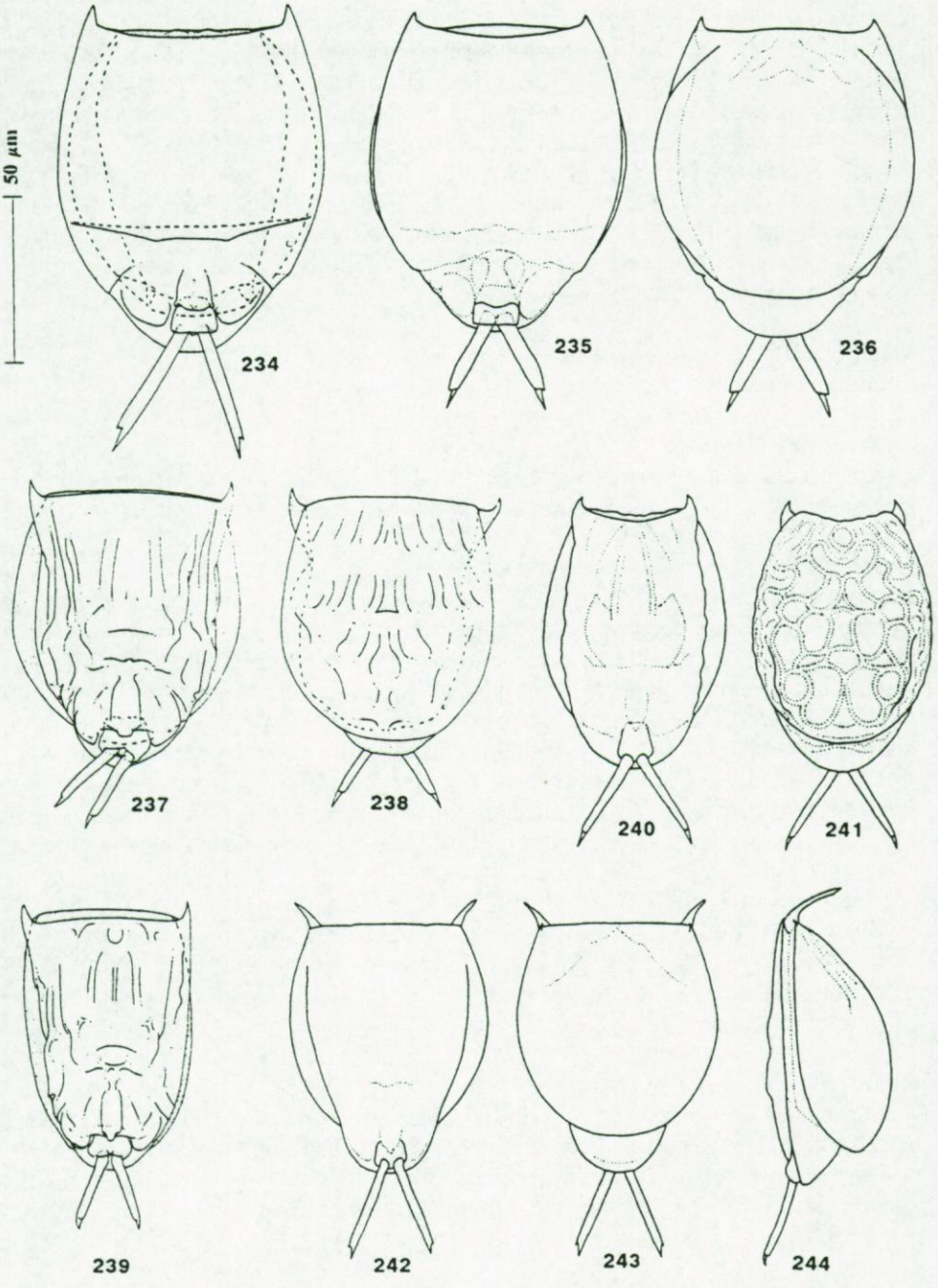
Figs 234-236: L. rhenana. 234-235: ventral view, 236: dorsal view.
Figs 237-239: L. flexilis. 237, 239: ventral view, 239: incompletely contracted specimen, 238: dorsal view.
Figs 240-241: L. infula. 240: ventral view, 241: dorsal view.
Figs 242-244: L. mucronata. 242: ventral view, 243: dorsal view, 244: lateral view.
(234: Lagoon 7 km. S of Boa Vista, Roraima, Brazil; 235-236: after Hauer, 1929; 237: Turkey (Segers *et al.*, 1992); 238: Tap water, Gent, Belgium; 239: Nigeria (Segers *et al.*, 1993a); 240-244: after Harring & Myers, 1926).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Gosse *in*: Hudson & Gosse 1886 p. 97 plate 24 fig. 7 (*Distyla flexilis*); Gosse 1887c p. 867 plate 15 fig. 16 (*Distyla lipara*); Stenroos 1898 p. 159 plate 2 fig. 19 (*Cathypna flexilis*); Harring 1913a p. 61 (*Lecane flexilis*); Murray 1913c p. 555 plate 22 figs 8a, b (*Cathypna brevis*); Harring 1914 p. 538-539 plate 19 figs 1-3; p. 540-541 plate 20 figs 1-3 (*L. compta*); Harring & Myers 1926 p. 355-357 plate 24 figs 3, 4; p. 360 plate 26 figs 1, 2 (*L. glypta*); Carlin 1939 p. 18-19 figs 4d-f; Voigt 1957 p. 238; Wulfert 1960 p. 280 figs 17a-c (*L. glypta*); Kutikova 1970 p. 439 fig. 578; p. 444 fig. 618 (*L. glypta*); Koste 1978 p. 227 plate 75 figs 1a-c, 7a, b (*L. glypta*); p. 227-228 plate 75 figs 3a-i, plate 76 figs 11a-d, 12a, b, 13; Koste & Shiel 1990 p. 20 plate 9 fig. 4; p. 21-23 plate 9 fig. 6 (*L. glypta*).

Type locality
Sandhurst, U.K.

Differential diagnosis
L. flexilis resembles *L. stichaea*. It can be distinguished by its non-projecting foot pseudosegment, its relatively short toes and lorica, and more prominent foot plate.

Description
Lorica only slightly longer than wide when contracted, elongate when expanded (fig. 239; see *L. glypta*). Dorsal plate medially wider, anteriorly narrower than ventral plate, ornamented. Head aperture margins coincident, straight to slightly convex. Antero-lateral spines present. Ventral plate ornamented, longer than wide in contracted, elongate in non-contracted specimens. An incomplete transverse and longitudinal folds present. Lateral margins irregularly folded, with anterior notches. Lateral sulci shallow. Foot plate broad, truncate posteriorly. Coxal plates rounded. Prepedal fold narrow, elongate, distally with median projection. Foot pseudosegment simple, not projecting. Toes relatively short, bearing incompletely separated, curved pseudoclaws.

Measurements: DPl. 60-76 (75-80), DPw. 55-66 (50), VPl. 66-80 (80-86), VPw. 50-60 (42-46), toe l. 19-25, claw l. 3-5 (non-contracted specimens).

Distribution
Cosmopolitan, common.

Comments
The specimen on which Russell (1956) based his f. *nuda* (in Canterbury Museum, Christchurch, New Zealand, examined) is an empty lorica of *L. flexilis*. This observation supports the view of, amongst others, Wiszniewski (1954), that *L. glypta* is an uncontracted *L. flexilis*, such as the one represented in figure 239.

62. *Lecane mucronata* Harring & Myers, 1926
Figs 242-244

Harring & Myers 1926 p. 330-331 plate 29 figs 3-5; Chengalath & Mulamoottil 1974 p. 950 figs 27, 28; Koste 1978 p. 233 plate 76 figs 10a-c.

Type locality
Oneida and Vilas Counties, Wisconsin; Mount Desert Island, Maine, around Atlantic city and Batsto, New Jersey, U.S.A.

Differential diagnosis
L. mucronata is easily recognised by its unique elongate and slightly curved antero-lateral spines.

Description
Loricate *Lecane*. Dorsal plate wider than ventral plate. Head aperture margins coincident, straight, antero-lateral spines exceptionally long, curved outwards. Dorsal plate smooth. Ventral plate longer than wide, smooth. Transverse fold incomplete. Lateral margins slightly curved, smooth. Lateral sulci deep. Foot plate broad, coxal plates rounded. Prepedal fold narrow, elongate, distally with median projection. Foot pseudosegment broadest distally, not projecting. Toes parallel-sided, with pseudoclaws and accessory claws.

Measurements: DPl. 115, DPw. 105, VPl. 126, VPw. 84, toe l. 48, claw l. 6, antero-lateral spines l. 28.

Distribution
Recorded only from the U.S.A. and Canada. Probably a Nearctic species.

63. *Lecane eylesi* Russell, 1953
Figure 245

Synonym: *L. tasmaniensis* Shiel & Koste, 1985 (n. syn.)

Russell 1953 p. 239-240 figs 1-3; Koste 1978 p. 215; Shiel & Koste 1985 p. 7-8 fig. 3 (*L. tasmaniensis*); Koste & Shiel 1990 p. 33-34 plate 15 fig. 5 (*L. tasmaniensis*); Sanoamuang & Stout 1993 p. 488 fig. 5 (*L. tasmaniensis*).

Type locality and type
Hemokawa and Owenga, Chatham Islands. Type in Canterbury museum, Christchurch, New Zealand.

Differential diagnosis
By its dorsal plate being consistently wider than the ventral plate, and by the presence of antero-lateral spines, this species resembles *L. signifera*. It is characterised by its toes bearing claws and accessory claws.

Description
Loricate *Lecane*. Dorsal plate wider than ventral plate, smooth. Head aperture margins coincident, straight or ventral margin slightly concave, dorsal occasionally with median notch. Antero-lateral spines, formed by ventral and dorsal plate present. Ventral plate longer than wide, transverse fold incomplete. Lateral margins smooth, curved, with smooth anterior notches. Lateral sulci present. Foot plate broad, rounded posteriorly, coxal plates rounded triangular. Prepedal fold narrow, elongate,

distally with median projection. Foot pseudosegment broadly rectangular, not projecting. Toes long, parallel-sided, bearing incompletely separated, needle-like pseudoclaws and accessory claws.

Measurements: DPl. 106-115, DPw. 86, VPl. 118-126, VPw. 70-79, toe l. 42-59, claw l. 10-12.

Distribution
Known from the Chatham Islands, Tasmania and New Zealand.

Comments
The synonymy of *L. tasmaniensis* with *L. eylesi* was established by comparing the types of *L. eylesi* with photographs of the types and material identified as *L. tasmaniensis*.

Note
Lecane leura Myers, 1942 (Figure 246, type in PANS), from Pocono Lake, Pennsylvania, U.S.A., and Lake Bala, Ontario, Canada, is a very similar species, differing from *L. eylesi* by the antero-lateral spines being extensions of the ventral plate, and not of the dorsal plate.

Measurements: DPl. 87, DPw. 72, VPl. 99, VPw. 64, toe l. 33, claw l. 7.

64. *Lecane bifastigata* Hauer, 1938
Figs 252-253

Hauer 1938 p. 511 figs 35a, b; Tarnogradski 1961b p. 38-39 figs 5-7; Kutikova 1970 p. 438 fig. 575; Chengalath *et al.*, 1974 p. 84 figs 6, 7; Sharma 1979 p. 55 figs 1, 2; Koste 1978 p. 234 plate 77 figs 2a-c; Segers & Dumont 1993b p. 15 figs 6a-c.

Type locality and types
Tjigombong reservoir, Java. Apparent syntypes in RUG.

Differential diagnosis
L. bifastigata, although being related to *L. crepida* and *L. eswari*, can not be confused with any congener by its conspicuous posterior projection, having distinct postero-lateral, upward-curved spines.

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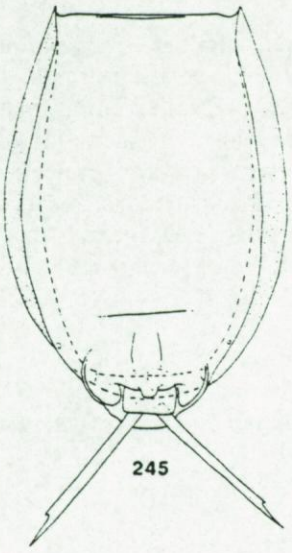
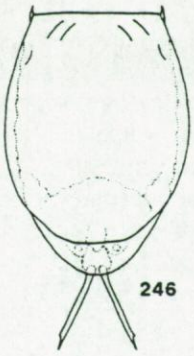
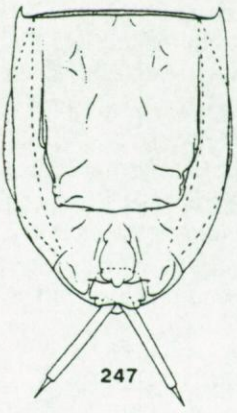
Fig. 245: L. eylesi, ventral view.
Fig. 246: L. leura, dorsal view.
Figs 247-249: L. aspasia. 247-248: ventral view, 249: dorsal view.
Figs 250-251: L. schraederi. 250: ventral view, 251: dorsal view.
Figs 252-253: L. bifastigata. 252: ventral view, 253: dorsal view.
Figs 254-255: L. eswari. 254: ventral view, 255: dorsal view.
(245: Roadside pool between Kumara and Greymouth, New Zealand, leg. & det. L. Sanoamuang; 246: after Myers, 1942; 247: after Segers *et al.*, 1994; 248-249: Lake Glubokoe, Russia; 250-251: after Wulfert, 1966; 252-253: after Segers & Dumont, 1993b; 254-255: Chandigarh, Northern India, India, leg. S.S.S. Sarma).







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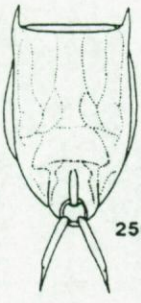

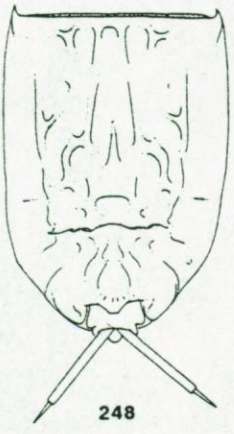

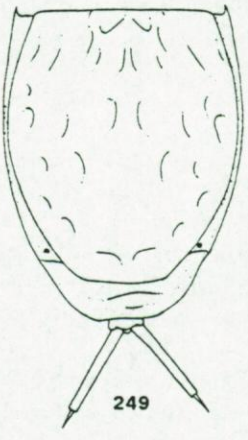

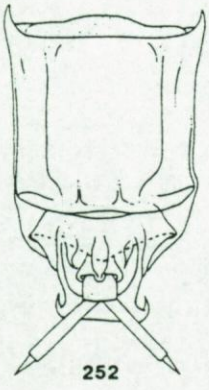

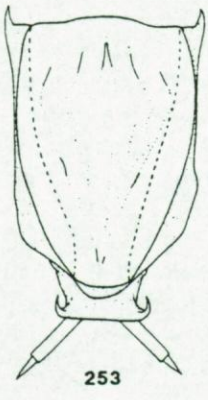

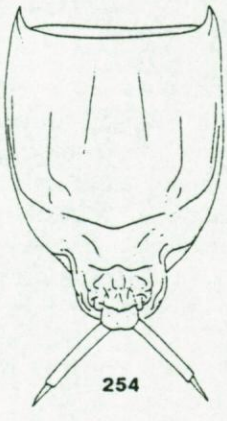

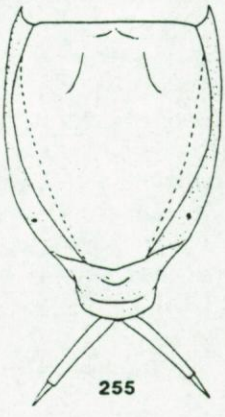

Description
Lorica moderately stiff. Dorsal plate narrower than ventral, with semi-longitudinal folds. Lateral sulci deep. Head aperture margin dorsally and ventrally straight or dorsally convex, nearly coincident. Antero-lateral spines present. Ventral plate longer than wide, with complete transverse and longitudinal folds. Lateral margins of ventral plate smooth, straight, nearly parallel. Foot plate with posterior projection bearing upwards-curved postero-lateral spines. Coxal plates inconspicuous. Prepedal fold elongate, posteriorly with median projection. Foot pseudosegment nearly squarish, not projecting. Toes parallel-sided, robust, bearing completely separated claws.

Measurements: DPl. 69-85, DPw. 55-66, VPl. 89-92, VPw. 52-64, toe l. 23-26, claw l. 8-10.

Distribution
Known from Armenia, India, Java, Oman, Sri Lanka, Thailand and Turkey. A rare, apparently Oriental species.

65. *Lecane eswari* Dhanapathi, 1976
Figs 254-255

Dhanapathi 1976b p. 191-192 figs 1-2.

Type locality
L.K. Tank, Palakol, West Godavari Dt.; Municipal Tank, Kaikalur, Krishna Dt., Andhra Pradesh, India.

Differential diagnosis
L. eswari can be confused with *L. crepida* or *L. hastata*. It differs from *L. crepida* by its scarcely projecting foot pseudosegment and more prominent foot plate, and from *L. hastata* by its different foot pseudosegment shape and simple claws.

Description
Loricate *Lecane*. Dorsal plate narrower than ventral plate. Head aperture margin nearly coincident, almost straight. Antero-lateral spines present. Dorsal plate nearly smooth, with some folds in anterior region. Ventral plate elongate, with complete transverse and some longitudinal folds. Lateral margins smooth, nearly straight, parallel. Lateral sulci shallow. Foot plate clearly separated from ventral plate, rather flexible, with inconspicuous coxal plates. Prepedal fold narrow, posterior margin with median projection. Foot pseudosegment elongate, scarcely projecting. Toes parallel-sided, slightly curved or straight, bearing completely separated, relatively thick claws.

Measurements: DPl. 70-77, DPw. 63-70, VPl. 84-88, VPw. 56-67, toe l. 28, claw l. 7-9.

Distribution
Known from the type locality, and from Chandigarh, North India (leg. S.S.S. Sarma). The species is endemic to India.

66. *Lecane schraederi* Wulfert, 1966
Figs 250-251

Wulfert 1966 p. 78-79 figs 32a, b; Koste 1978 p. 228 plate 75 figs 5a, b.

Type locality
Nimeta water works, Baroda, India.

Differential diagnosis
The species is reported to be close to *L. eutarsa* and *L. pelatis*, and to differ from these by its non-projecting foot pseudosegment and stouter toes. *L. schraederi* may be related to *L. crepida*, *L. eswari* and *L. hastata*, but has a medially wider dorsal than ventral plate.

Description
Lorica stiff. Dorsal plate anteriorly narrower, medially wider than ventral plate, with semi-longitudinal folds. Head aperture margins almost coincident, nearly straight, with strong antero-lateral spines. Ventral plate elongate, with incomplete transverse and longitudinal folds, ornamented. Lateral margins smooth, straight. Foot plate clearly separated from ventral plate, projecting. Coxal plates indistinct. Prepedal fold narrow, elongate, distally with median projection. Foot pseudosegment not projecting. Toes parallel-sided, relatively short and stout, bearing long, completely separated claws.

Measurements: DPl. 80, DPw. 58, VPl. 90, VPw. 51, toe l. 25, claw l. 7.

Distribution
A single record from the type locality.

67. *Lecane aspasia* Myers, 1917
Figs 247-249

Myers 1917 p. 476 plate 40 figs 6-8; Harring & Myers 1926 p. 349 plate 21 figs 5, 6; Hauer 1938 p. 510-511 figs 34a, b; Kutikova 1970 p. 445 fig. 587; Koste & Shiel 1990 p. 19 plate 8 fig. 2; Segers *et al.* 1994 p. 252 fig. 2

Type locality
Pool on alligator farm, near East Lake Park, Los Angeles, California, U.S.A.

Differential diagnosis
The species can be distinguished from *L. aeganea* by its antero-lateral spines; from *L. haliclysta* by its scarcely projecting and characteristic foot pseudosegment, and from *L. stichoclysta* by the shape of its foot pseudosegment (with lateral lobes), its relatively shorter claws and narrower dorsal plate.

Description
Lorica stiff. Dorsal plate anteriorly narrower, medially about as wide as ventral plate, ornamented. Lateral sulci shallow. Head aperture margin dorsally and ventrally

straight, coincident, with small antero-lateral spines. Ventral plate longer than wide, with incomplete transverse and longitudinal folds, ornamented. Lateral margins nearly straight, smooth, parallel. Foot plate with rounded coxal plates, prepedal fold elongate, narrow, posteriorly with median projection. Foot pseudosegment wider than long, with lateral lobes, scarcely projecting. Toes parallel-sided, with sharp, completely separated claws.

Measurements: DPl. 67-82, DPw. 75, VPl. 78-94, VPw. 62-75, toe l. 24-30, claw l. 7-8.

Distribution

Probably cosmopolitan: illustrated records are from California (Myers, 1917), Sumatra (Hauer, 1937, 1938), India and Europe (Hungary, Russia).

68. *Lecane stichoclysta* Segers, 1993
Figs 256-258

Segers 1993 p. 57-58 figs 20a-c.

Type locality and types

Swamp in mouth of Utu river, Oguta Lake, Imo State, Nigeria. Holotype and paratypes in MRAC, paratypes in RUG.

Differential diagnosis

L. stichoclysta can be distinguished from *L. haliclysta* and *L. stichaea* by its scarcely projecting, parallel-sided foot pseudosegment and the presence of completely separated and relatively longer claws.

Description

Lorica stiff. Dorsal plate anteriorly narrower, medially wider than ventral plate, ornamented. Head aperture margin dorsally and ventrally slightly convex, coincident, with small antero-lateral spines. Ventral plate elongate, with incomplete transverse and longitudinal folds, ornamented. Lateral margins curved, smooth or irregularly folded, with anterior notches. Lateral sulci shallow. Foot plate with rounded coxal plates. Prepedal fold narrow, elongate, distally with median projection. Foot pseudosegment squarish, parallel-sided, not projecting (projecting in a single incompletely contracted specimen only). Toes relatively short, parallel-sided, with distinct claws.

Measurements: DPl. 66-68, DPw. 50-56, VPl. 71-78, VPw. 45-50, toe l. 20-21, claw l. 9-10.

Distribution

Single record from the type locality in Nigeria, where it was common.

69. *Lecane satyrus* Harring & Myers, 1926
Figs 259-260

Harring & Myers 1926 p. 362-363 plate 27 figs 3, 4; Yamamoto 1960 p. 392 fig. 7c; Koste 1978 p. 233 plate 77 figs 4a, b.

Type locality
Glenburnie, near Baltimore, Maryland; Mount Desert Island, Maine; Polk County, Florida; around Atlantic City, New Jersey; Vilas County, Wisconsin, U.S.A.

Differential diagnosis
L. satyrus can, by its remarkable antero-lateral spines, not be confused with any other *Lecane*.

Description
Lorica stiff. Dorsal plate medially wider than ventral plate, ornamented. Anterior margin of dorsal plate with straight median part, boarded laterally with some spicules. Ventral head aperture margin slightly convex. Antero-lateral projections characteristic, barbed. Ventral plate elongate, with incomplete transverse and longitudinal folds, ornamented. Lateral margins smooth, nearly straight. Foot plate wide, with rounded coxal plates. Prepedal fold narrow, elongate, distally with median projection. Foot pseudosegment projecting, widest distally. Toes parallel-sided, with pseudoclaws.

Measurements: DPl. 95, DPw. 78, VPl. 105, VPw. 72, ant. spine l. 25, toe l. 34, claw l. 7.

Distribution
Recorded from *Sphagnum*-bogs in the U.S.A., Canada and Japan. A rare species.

70. *Lecane boettgeri* Koste, 1986
Figs 261-263

Koste 1986 p. 149-150 figs 14a-c, 15a-c.

Type locality and type
Inundation area near Concepción, Paraguay. Holotype in SMF.

Differential diagnosis
The species is close to *L. eutarsa*. It is characterised by the presence of huge, smoothly curved antero-lateral spines, bearing ventral lamellae.

Description
Lorica stiff, elongate. Dorsal plate anteriorly narrower, medially wider than ventral plate, ornamented. Lateral sulci deep. Head aperture margin dorsally and ventrally concave, with large, curved antero-lateral spines bearing anterior lamellae. Ventral plate elongate, ornamented. Transverse fold incomplete. Lateral margins smooth, straight, nearly parallel. Foot pseudosegment projecting, elongate, with lateral lobes.

Toes relatively long, parallel-sided. Claws relatively long, inserted eccentrically.
Measurements: DPl. 72, DPw. 49, VPl. 86, VPw. 40, toe l. 47, claw l. 10-12.

Distribution
Single record from the type locality in Paraguay.

71. *Lecane crepida* Harring, 1914
Figs 268-269

Synonyms: *L. neali* Wulfert, 1966
L. crepida longidactyla Koste, 1972
L. vasishti Sharma, 1980 (n. syn.)

L. gissensis (Eckstein, 1883) after Jennings (1900)

Infrasubspecific taxon: var. *bengalensis* Sharma, 1978b

Jennings 1900 p. 91 plate 20 figs 33-34; Harring 1914 p. 533-534 plate 22 figs 4-7; Harring & Myers 1926 p. 364-365 plate 28 figs 1, 2; Hauer 1938 p. 512-513 figs 36a, b; Wulfert 1966 p. 75 figs 26a-f (*L. neali*); Kutikova 1970 p. 442 fig. 585; Koste 1972 p. 384-385 plate 25 fig. 1 (*L. crepida longidactyla*); Koste 1978 p. 232 plate 76 figs 6a-e; plate 76 fig. 3 (var. *longidactyla*); plate 76 figs 5a-f (var. *neali*); Sharma 1978b p. 192 figs 3, 4 (var. *bengalensis*), Sharma 1980 p. 131-132 figs 1a, b (*L. vasishti*); Nogrady 1983 p. 109 fig. 3; Koste & Shiel 1990 p. 20 plate 8 fig. 6.

Type locality and type
Empire; near Gatun, Gatun Lake; Camacho reservoir; Rio Grande reservoir; Rio Grande; Panama. Type in NMNH.

Differential diagnosis
The species is rather peculiar and can hardly be confused with any other species. It resembles *L. aculeata*, but is readily distinguished by its dorsal plate being consistently narrower than the ventral plate. *L. crepida* is distinguished from the closely related *L. eswari* by its strongly projecting foot pseudosegment. Also, its lorica is stiffer and its foot plate less prominent than in *L. eswari*.

Description
Loricate *Lecane*. Dorsal plate narrower than ventral plate. Head aperture margins nearly coincident, straight, or dorsal slightly convex. Strong antero-lateral spines

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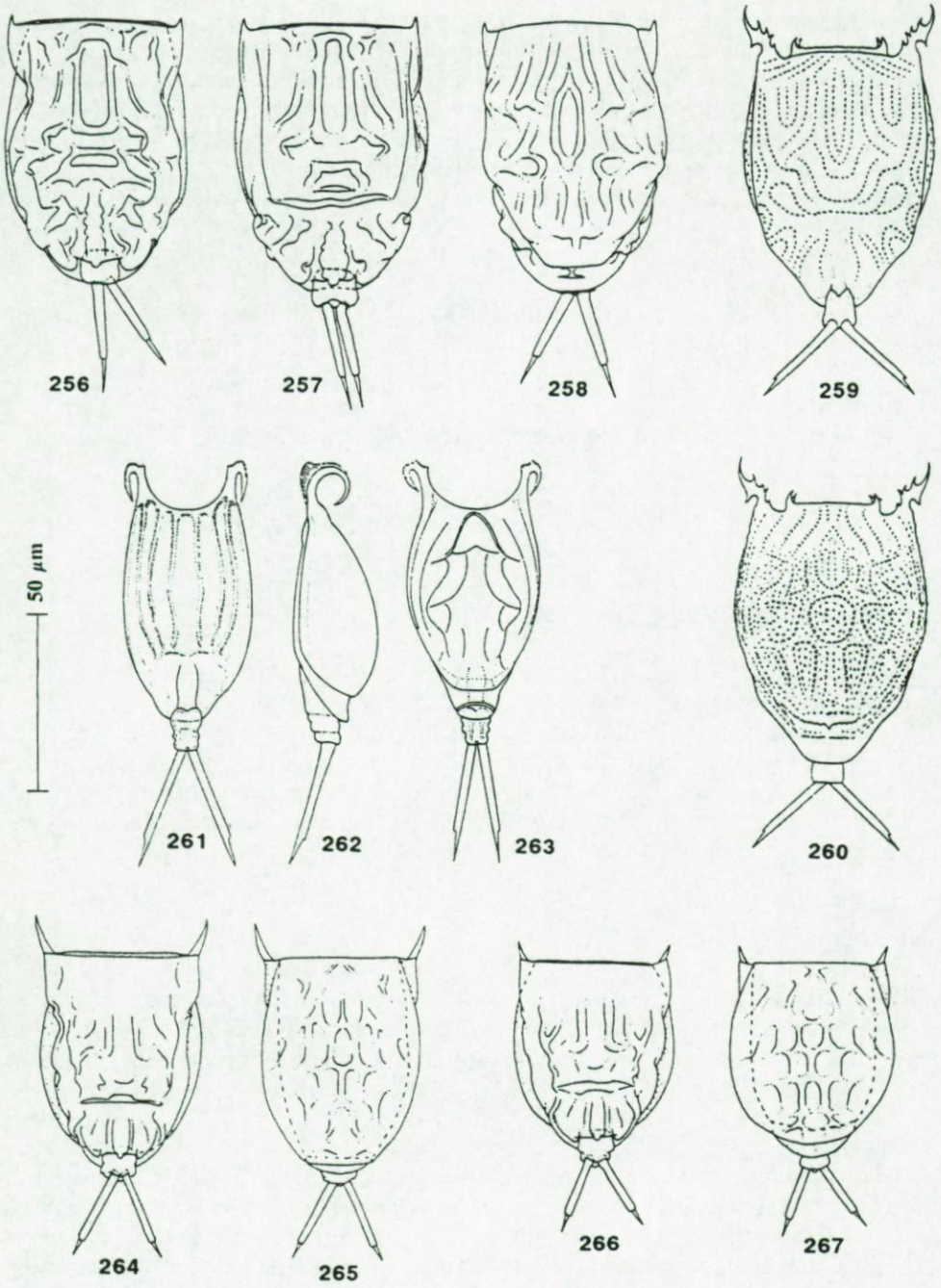
Figs 256-258: L. stichoclysta. 256-257: ventral view, 258: dorsal view.
Figs 259-260: L. satyrus. 259: ventral view, 260: dorsal view.
Figs 261-263: L. boettgeri. 261: ventral view, 262: lateral view, 263: dorsal view.
Figs 264-265: L. aculeata. 264: ventral view, 265: dorsal view.
Figs 266-267: L. arcula. 266: ventral view, 267: dorsal view.
(256-258: after Segers, 1993; 259-260: after Harring & Myers, 1926; 261-263: after Koste, 1986; 264-267: after Segers & Dumont, 1993b).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present. Dorsal plate with some semi-longitudinal folds. Ventral plate elongate, occasionally ornamented. Transverse fold complete. Lateral margins smooth, straight, parallel. Lateral sulci deep. Foot plate elongate, coxal plates rounded or inconspicuous. Prepedal fold narrow, elongate, posterior margin with median projection. Foot pseudosegment elongate, parallel-sided, distinctly projecting. Toes long, parallel-sided, bearing completely separated, relatively thick claws.

Measurements: DPl. 68-104, DPw. 45-52, VPl. 80-116, VPw. 53-68, toe l. 30-40, claw l. 9-16.

Distribution
Common in the littoral of larger water bodies, especially in the tropics and subtropics. Probably a warm-stenotherm.

Comments
L. vasishti is an imperfectly contracted *L. crepida*, similar to *L. neali*.

72. *Lecane aculeata* (Jakubski, 1912)
Figs 264-265

Synonym: *L. curvicerata* Yamamoto, 1951

Jakubski 1912 p. 543 figs 3,4 (*Distyla aculeata*); Wiszniewski 1932a p. 48 figs 1, 2 (*Lecane aculeata*); Hauer 1938 p. 508-509 figs 32a, b; Yamamoto 1951 p. 158 fig. 2 (*L. curvicerata*); Koste 1962 p. 105 figs 28a, b; Kutikova 1970 p. 442 fig. 586; Koste 1972 p. 383-384 figs 3a, b; De Ridder 1977 p. 111-112 fig. 30; Koste 1978 p. 231 plate 76 figs 2a-d, 15; p. 231-232 plate 76 figs 9a-c (var. *curvicerata*); De Ridder 1981 p. 73 plate 4 fig. 1; Koste & Shiel 1990 p. 19 plate 7 fig. 6; Segers & Dumont 1993b p. 13-15 figs 3a-f.

Type locality
Usangani steppe, Tanzania.

Differential diagnosis
L. aculeata differs from *L. arcula* by its relatively more elongate lorica (length:width ± 1.4 in *L. aculeata*, ± 1.2 in *L. arcula*) and its longer antero-lateral spines (7-11 µm in *L. aculeata*, 3-5 µm in *L. arcula*).

Description
Loricate *Lecane*. Dorsal plate anteriorly narrower, medially wider than ventral, ornamented. Head aperture margins nearly coincident, straight. Long, acutely pointed antero-lateral spines present, these clearly separated from ventral plate. Ventral plate elongate, with incomplete transverse and longitudinal folds, ornamented. Lateral margins irregularly undulate, straight, parallel or diverging to anteriorly, anterior notches present. Lateral sulci shallow. Foot plate projecting, nearly as wide as long. Coxal plates rounded triangular. Prepedal fold narrow, elongate, posteriorly with median projection. Foot pseudosegment with lateral lobes. Toes parallel-sided, claws completely separated, needle-like. Accessory claws present, occasionally inconspicuous.

Measurements: DPl. 62-67, DPw. 45-55, VPl. 72-87, VPw. 46-52, toe l. 22-28, claw l. 5-7, antero-lateral spine l. 7-10.

Distribution
Cosmopolitan, uncommon. The species is encountered more frequently in tropical and subtropical than in temperate waters.

73. *Lecane arcula* Harring, 1914
Figs 11, 29, 266-267

Synonym: *L. strandi* Bērziņš, 1943

Cathypna aculeata after Murray (1913a)

Harring 1914 p. 539-540 plate 19 figs 4-6; Harring & Myers 1926 p. 355 plate 24 figs 1, 2; Bērziņš 1943 p. 234-235 figs 14, 15 (*L. strandi*); Hauer 1935a p. 260 figs 1a, b; Hauer 1938 p. 509-510 figs 33a, b; Wulfert 1965 p. 358 figs 5a-b; Kutikova 1970 p. 442 fig. 584, p. 439 fig. 579 (*L. strandti*); Koste 1978 p. 231 plate 76 figs 1a, b (*L. aculeata* var. *arcula*, incl. *L. strandti*); Koste & Shiel 1990 p. 19 plate 8 fig. 1 (*L. aculeata arcula*); Segers & Dumont 1993b p. 13-15 figs 4a-f.

Type locality and type
Empire; near Gatun, Camacho reservoir, Rio Grande; Rio Trinidad; Agua Clara; Escoval, Panama. Type in NMNH.

Differential diagnosis
L. arcula is distinguished from *L. aculeata* by its relatively shorter lorica and antero-lateral spines. The species has been confused with *L. verecunda*, but is characterised by the antero-lateral spines being separated from the ventral plate, and by the shape of its foot pseudosegment.

Description
Lorica stiff. Dorsal plate anteriorly narrower, medially wider than ventral, ornamented. Head aperture margins nearly coincident, straight, with acutely pointed antero-lateral spines emerging from between the dorsal and ventral plate. Ventral plate longer than wide, with incomplete transverse and longitudinal folds, ornamented. Lateral margins irregularly undulate, straight, parallel or diverging to anteriorly. Anterior notches mostly present. Lateral sulci shallow. Foot plate nearly as wide as long, with rounded triangular coxal plates. Prepedal fold narrow, elongate, posteriorly with median projection. Foot pseudosegment projecting, with lateral lobes. Toes parallel-sided, occasionally bent proximally. Claws completely separated, needle-like. Accessory claws present, these sometimes inconspicuous.

Measurements: DPl. 57-63, DPw. 49-56, VPl. 72-87, VPw. 46-52, toe l. 22-27, claw l. 4-6, antero-lateral spine l. 3-5.

Distribution
Cosmopolitan, uncommon. Probably a warm-stenotherm.

74. *Lecane robertsonae* Segers, 1993
Figs 270-271

Synonym: *Lecane aspasia amazonica* Koste & Robertson, 1983 non (Koste, 1978).

Koste & Robertson 1983 p. 233 figs 6a-c; Segers 1993 p. 55-57 figs 19a, b.

Type locality
Ilha de Marchantaria, Amazon region, Brazil.

Differential diagnosis
L. robertsonae resembles *L. eutarsa* and *L. kutikowa*. It is distinguished from these by its completely separated, sharp claws. It also resembles *L. aspasia*, but its relatively longer claws and more elongate lorica, as well as its dorsal plate being much wider than the ventral plate, distinguish the species easily.

Description
Lorica stiff. Dorsal plate anteriorly narrower, medially wider than ventral plate, ornamented. Head aperture margins almost coincident, straight, with strong antero-lateral spines. Ventral plate elongate, with incomplete transverse and longitudinal folds, weakly ornamented. Lateral margins smooth, straight, parallel. Lateral sulci deep. Foot plate wide, with rounded triangular coxal plates. Prepedal fold narrow, elongate, distally with median projection. Foot pseudosegment projecting, lateral margins with lobes. Toes parallel-sided, bearing long claws.

Measurements: DPl. 85-101, DPw. 66-73, VPl. 97-111, VPw. 54-58, toe l. 38, claw l. 11-12.

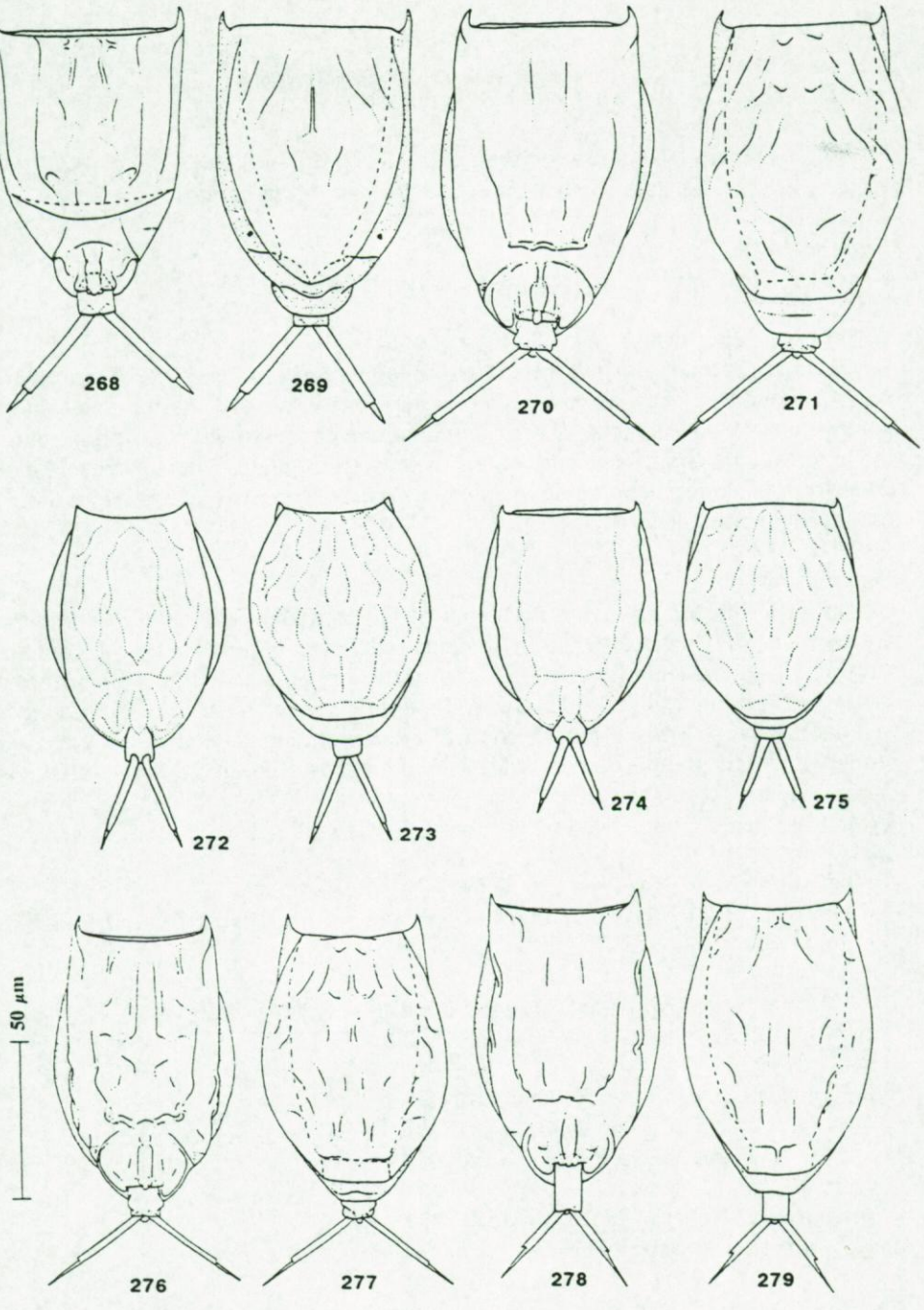
Distribution
L. robertsonae is a rare Amazonian endemic.

Note
L. pelatis Harring & Myers, 1926 (Figs 272-273), described from Minocqua, Wisconsin; Atlantic City, New Jersey and Mount Desert Island, Maine (U.S.A.), will key out here. The species is reported to have slightly concave anterior margins, a parallel-sided foot pseudosegment, to be relatively large with short toes and claws, and relatively broad. It has not been recorded since its description. According to Wiszniewski (1954), it is a synonym of *L. mira*.

Measurements: DPl. 110, DPw. 92, VPl. 122, VPw. 70, toe l. 35, claw l. 9.

→

Figs 268-269: L. crepida. 268: ventral view, 269: dorsal view.
Figs 270-271: L. robertsonae. 270: ventral view, 271: dorsal view.
Figs 272-273: L. pelatis. 272: ventral view, 273: dorsal view.
Figs 274-275: L. verecunda. 274: ventral view, 275: dorsal view.
Figs 276-277: L. eutarsa. 276: ventral view, 277: dorsal view.
Figs 278-279: L. kutikowa. 278: ventral view, 279: dorsal view.
(268-269: Madagascar (Segers, 1992); 270-271, 276-277: after Segers, 1993; 272-275: after Harring & Myers, 1926; 278-279: Rio Jatapú, Amazonas, Brazil).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279
50 µm

75. *Lecane verecunda* Harring & Myers, 1926
Figs 274-275

non *L. verecunda* after Chengalath & Fernando (1973)

Harring & Myers 1926 p. 358-359 plate 25 figs 3, 4; Kutikova 1970 p. 445 fig. 593; Koste 1978 p. 229 plate 75 figs 15a-b (*L. stichaea* f. *verecunda*).

Type locality
Near Madison, Wisconsin; Mount Desert Island, Maine, U.S.A.

Differential diagnosis
L. verecunda is distinguished from *L. stichaeoides* and *L. stichoclysta* by the shape of its foot pseudosegment, from *L. stichoclysta* by its relatively shorter claws and projecting foot pseudosegment. *L. verecunda* can be confused with *L. arcula*, but here the antero-lateral spines are projections of the ventral plate, whereas these are separated from the ventral and dorsal plate in *L. arcula*. Moreover, the shape of their foot pseudosegment is different.

Description
Lorica stiff. Dorsal plate anteriorly narrower, medially wider than ventral plate, ornamented. Head aperture margin dorsally and ventrally nearly straight, coincident, with small antero-lateral spines. Ventral plate longer than wide, with incomplete transverse and longitudinal folds. Lateral margins irregularly folded. Foot plate with rounded triangular coxal plates. Prepedal fold narrow, elongate, distally with median projection. Foot pseudosegment widest medially, projecting. Toes relatively short, parallel-sided, claws short, distinct.

Measurements: DPl. 72, DPw. 60, VPl. 76, VPw. 50, toe l. 22, claw l. 6.

Distribution
Only known from the type locality. A single unconfirmed record from Moldavia.

76. *Lecane eutarsa* Harring & Myers, 1926
Figs 30-31, 276-277

Synonyms: *L. amazoniana* Koste & Robertson, 1983
L. stichaea var. *amazonica* Koste, 1978
L. amazonica Koste & Böttger, 1992 non (Murray, 1913)

L. rhytida after Hauer (1965b), Koste (1972)
non *L. eutarsa* after Wang (1961)

Harring & Myers 1926 p. 341-342 plate 18 figs 1, 2; Koste 1978 p. 230 plate 75 fig. 13 (*L. stichaea* var. *amazonica*); Koste & Robertson 1983 p. 232-232 figs 5a-c (*L. amazoniana*); Koste & Böttger 1992 p. 288-289 fig. 8 ('*L. amazonica* nov. nom.'); Segers 1993 p. 55.

Type locality
Near Puerto Barrios, Guatemala.

Differential diagnosis
The species is close to *L. rhytida*, but is easily distinguished by its long, eccentrically inserted claws. Only *L. kutikowa* has similar claws, but *L. eutarsa* misses the extraordinarily elongated foot pseudosegment of *L. kutikowa*. *L. eutarsa* superficially resembles *L. mira*, but it is slenderer and has relatively longer claws. *L. eutarsa* differs from *L. robertsonae* by its smaller size and eccentrically inserted claws.

Description
Lorica stiff. Dorsal plate anteriorly narrower, medially wider than ventral plate, ornamented. Head aperture margins almost coincident, slightly concave, with strong antero-lateral spines. Ventral plate elongate, with incomplete transverse and longitudinal folds, ornamented. Lateral margins smooth or with anterior notches, straight, parallel. Lateral sulci deep. Foot plate wide, with rounded triangular coxal plates. Prepedal fold narrow, elongate, distally with median projection. Foot pseudosegment projecting, lateral margins with lobes. Toes parallel-sided, bearing long, eccentrically inserted claws.

Measurements: DPl. 72-95, DPw. 58-64, VPl. 82-102, VPw. 46-60, toe l. 20-38, claw l. 11-15.

Distribution
Endemic to the Neotropic region, where it is rather common.

77. *Lecane kutikowa* Koste, 1972
Figs 278-279

Synonym: *L. kutikova* Koste, 1978

Koste 1972 p. 388 plate 26 fig. 1; Koste 1978 p. 230-231 plate 75 fig. 17 (*L. kutikova*).

Type locality
Igarapé, near Cururú, Amazon region, Brazil.

Differential diagnosis
Lecane kutikowa differs from *L. eutarsa* and *L. robertsonae* by its extraordinary long, projecting and parallel-sided foot pseudosegment, from *L. robertsonae* also by its eccentrically inserted claws.

Description
Lorica stiff. Dorsal plate anteriorly narrower, medially wider than ventral plate, ornamented. Head aperture margins almost coincident, slightly concave, with strong antero-lateral spines. Ventral plate elongate, with incomplete transverse and longitudinal folds, ornamented. Lateral margins with anterior notches, straight, nearly parallel. Lateral sulci deep. Foot plate wide, with rounded triangular coxal plates.

Prepedal fold narrow, elongate, distally with median projection. Foot pseudosegment elongate rectangular, parallel-sided, projecting. Toes relatively short, parallel-sided, with long, eccentrically inserted claws and accessory claws.

Measurements: DPl. 93, DPw. 68, VPl. 98, VPw. 60, Foot pseudosegment l. 20, toe l. 21, claw l. 15.

Distribution
Endemic to the Amazon region, rare.

Comments
The name *L. kutikova* after Koste (1978) is an 'unjustified emendation', in the sense of the ICZN (cf. art. **32**(c)(ii), **33**(b)(i) and (iii)). As such, it is an available name, to be treated as a junior objective synonym of *L. kutikowa* (art. **35**(b)(iii)).

78. *Lecane haliclysta* Harring & Myers, 1926
Figs 60, 280-285

Synonym: *L. stichaeoides* Hauer, 1938 (n. syn.)

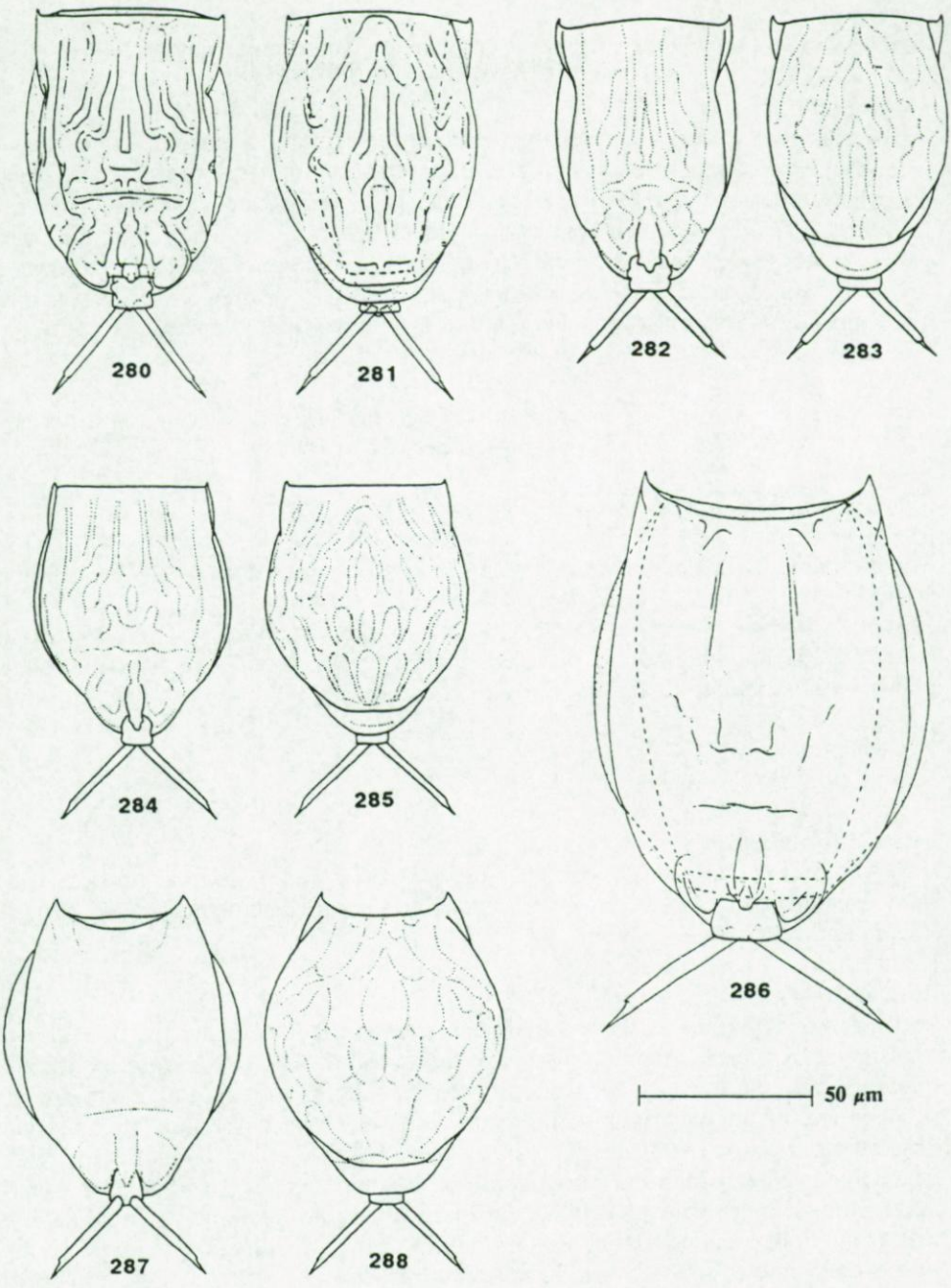
Harring & Myers 1926 p. 348-349 plate 21 figs 3, 4; Hauer 1938 p. 523-524 figs 47a, b (*L. stichaeoides*); Wulfert 1960 p. 281 fig. 19; Hauer 1965b p. 359-360 fig. 17; Koste 1978 p. 228 plate 75 figs 6a-d; p. 229 plate 75 figs 11a, b (*L. stichaea* f. *stichoides*); Koste & Shiel 1990 p. 23 plate 10 fig. 2.

Type locality
Oneida and Vilas Counties, Wisconsin; Atlantic City, new Jersey; Mount Desert Island, Maine; Hatcherie Bay, South Bass Island, U.S.A.; Lake Erie, Canada.

Differential diagnosis
L. haliclysta can be confused with *L. donneri*, which has a projecting and different foot pseudosegment, and a generally different lorica. *L. haliclysta* has a foot pseudosegment with lateral lobes and an incompletely separated claw, which distinguishes the taxon from *L. stichaea* and relatives. Its incompletely separated claws and shape of foot pseudosegment distinguish *L. haliclysta* from *L. stichoclysta*, *L. pelatis* and *L. verecunda*.

Description
Lorica stiff. Dorsal plate anteriorly narrower, medially wider than ventral plate, ornamented. Lateral sulci deep. Head aperture margin dorsally and ventrally straight or dorsally slightly convex, coincident. Small antero-lateral spines present. Ventral plate longer than wide or elongate, with incomplete transverse and longitudinal folds, ornamented. Lateral margins smooth, slightly curved or irregularly undulate, with anterior notches. Foot plate with rounded coxal plates. Prepedal fold narrow, elongate, distally with median projection. Foot pseudosegment as wide as long, with lateral lobes, projecting. Toes parallel-sided, claws indistinctly separated.

Measurements: DPl. 71-90, DPw. 55-78, VPl. 81-105, VPw. 48-74, anterior edge w. 51-60, toe l. 23-36, claw l. 7-8.



Figs 280-285: L. haliclysta. 280, 282, 284: ventral view, 281, 283, 285: dorsal view.
Figs 286-288: L. mira. 286-287: ventral view, 288: dorsal view.
(280-281: after Segers, 1993 (sub. *L. stichaeoides*); 282-283: after Hauer, 1938 (sub. *L. stichaeoides*); 284-285, 287-288: after Harring & Myers, 1926; 286: pond near Lake Glubokoe, Russia).

Distribution
Rare, cosmopolitan. More frequent in tropical and subtropical waters.

Comments
Apart of a small difference in relative width of the ventral plate, which is likely to be a consequence of a difference in degree of contraction, the only character differentiating between *L. haliclysta* and *L. stichaeoides* is the presence of 'indistinct' (Harring & Myers, 1926) or 'deutlich abgesetzte' (Hauer, 1938) claws. The separation of the claws is easily interpreted differently, judging from material identified as *L. stichaeoides* by Segers *et al.* (1993a), and from conspecific specimens from Brazil, India and Zaire. It is therefore concluded that the two names are synonyms.

79. *Lecane mira* (Murray, 1913c)
Figs 286-288

Synonym: *L. islandica* De Ridder, 1967 (n. syn.)

Murray 1913c p. 553-554 plate 22 fig. 3 (*Cathypna mira*); Harring & Myers 1926 p. 342-343 plate 18 figs 5, 6 (*L. mira*); Hauer 1929 p. 146-147 figs 2a, b; Pawłowski 1938 p. 132-134 figs 4-6; De Ridder 1967 p. 224-226 plate 3 figs 5a-e (*L. islandica*); Kutikova 1970 p. 443-445 fig. 588; Koste 1978 p. 227 plate 74 figs 8a-d; Koste & Shiel 1990 p. 27 plate 12 fig. 4.

Type locality
Washington, D.C., U.S.A.

Differential diagnosis
L. mira resembles *L. eutarsa*, but has a broader lorica and more robust toes bearing short pseudoclaws. The presence of pseudoclaws distinguishes the species from *L. rhytida* and relatives.

Description
Lorica rather soft, general shape variable according to degree of contraction. Dorsal plate medially wider, anteriorly narrower than ventral plate. Head aperture margin smoothly concave dorsally and ventrally. Antero-lateral corners with sharp spines. Dorsal plate ornamented or smooth, lateral edges reach head aperture. Ventral plate longer than wide to elongate, with incomplete transverse and longitudinal folds, ornamented. Lateral margins smooth, curved. Lateral sulci deep. Foot plate broad, coxal plates rounded triangular. Prepedal fold narrow, elongate, distally with median projection. Foot pseudosegment broadest in dist half, projecting. Toes parallel-sided, with pseudoclaws. Accessory claws present or absent.

Measurements: DPl. 108-132, DPw. 97-130, VPl. 131-145, VPw. 88-100, toe l. 38-44, claw l. 9-12.

Distribution
This species is probably Holarctic, an Australian record is non-illustrated and needs confirmation. *L. mira* is found in the littoral of acid waters.

Comments
L. islandica De Ridder appears to be a badly contracted *L. mira*: compare figs 5, 5a-d of De Ridder (1967) with figs 4-6 in Pawłowski (1938).

80. *Lecane stichaea* Harring, 1913b
Figs 290-294

Synonyms: *L. methoria* Harring & Myers, 1926
L. saginata Harring & Myers, 1926

Harring 1913b p. 397-398 plate 35 figs 4-6; Harring & Myers 1926 p. 343-344 plate 19 figs 1, 2 (*L. methoria*); p. 344 plate 19 figs 3, 4; p. 345 plate 19 figs 5, 6 (*L. saginata*); Hauer 1935b p. 86 fig. 18; Pawłowski 1938 p. 134 fig. 7 (*L. saginata*); Carlin 1939 p. 22-23 figs 6a, b; Pejler 1962 p. 364-368 figs 90-92; Kutikova 1970 p. 444 fig. 589; fig. 590 (*L. stichaea methoria*); p. 446 fig. 591 (*L. saginata*); Koste 1978 p. 228-230 plate 75 figs 12a-e, 16a, b (incl. f. *saginata*); Koste & Shiel 1990 p. 33 plate 15 fig. 2.; Segers 1993 p. 58 figs 22a, b.

Type locality
Glenburnie, Maryland, U.S.A.

Differential diagnosis
L. stichaea differs from *L. intrasinuata* by its elongate (ventral plate nearly twice as long as wide) and ornamented lorica; from *L. flexilis* by its projecting foot pseudosegment and different shape of caudal region of ventral plate, and from L. *haliclysta*, *L. stichoclysta* and *L. verecunda* by its toes bearing pseudoclaws, not claws.

Description
Lorica stiff. Dorsal plate anteriorly narrower, medially wider than ventral plate, mostly ornamented. Lateral sulci shallow. Head aperture margin dorsally and ventrally slightly convex or straight, coincident or nearly so. Small antero-lateral spines present. Ventral plate elongate, with incomplete transverse and longitudinal folds, mostly ornamented. Lateral margins curved, irregularly undulate, with anterior notches. Foot plate with rounded triangular coxal plates. Prepedal fold narrow, elongate, distally with median projection. Foot pseudosegment wider than long, nearly parallel-sided or widest in its distal half, projecting. Toes parallel-sided, bearing pseudoclaws.

Measurements: DPl. 75-92, DPw. 66-76, VPl. 81-105, VPw. 45-54, toe l. 22-33, claw l. 5-7.

Distribution
Cosmopolitan. *L. stichaea* is common in littoral/periphytic habitats.

Comments
The size, degree of ornamentation and details of the lorica shape are subject to intraspecific variability or depend on the degree of contraction of the lorica. As a

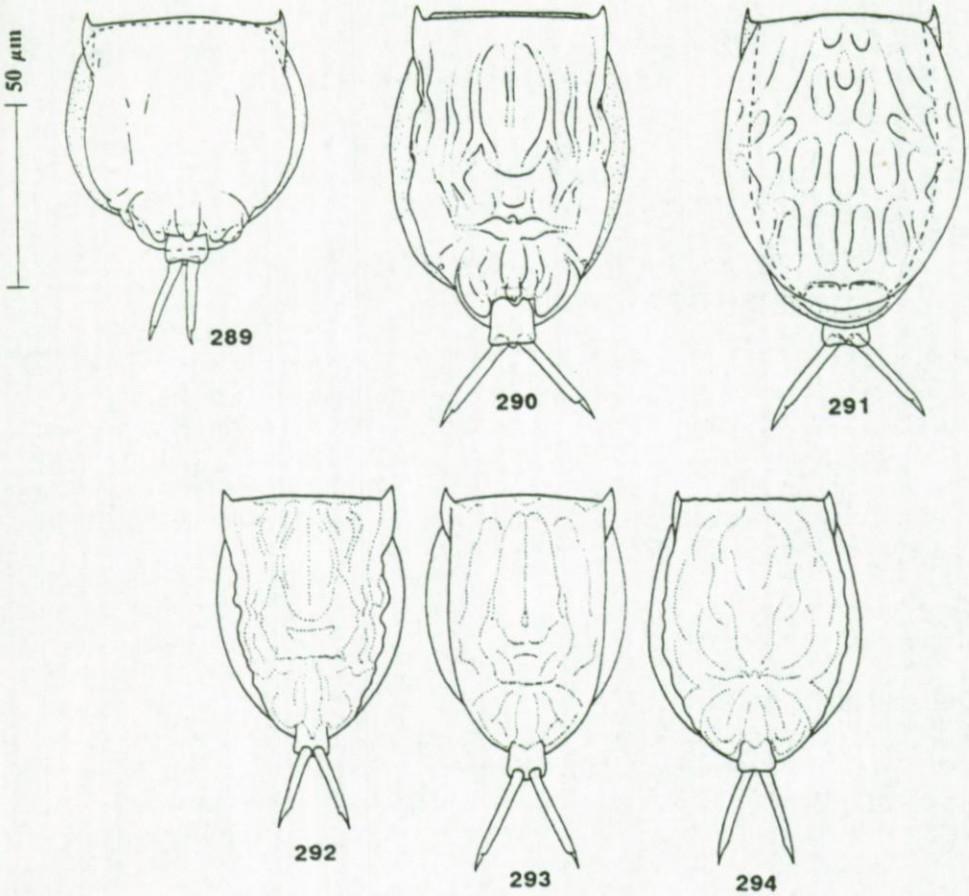


Fig. 289: L. intrasinuata, ventral view.
Figs 290-294: L. stichaea. 290, 292-294: ventral view, 291: dorsal view.
(289: tap water, Gent, Belgium; 290-291: after Segers, 1993; 292-294: after Harring & Myers, 1926 (292 sub. *L. methoria*, 294 sub. *L. saginata*)).

consequence, the taxonomy of the group (incl. *L. stichaea*, *L. intrasinuata* and the synonyms listed) remains unsatisfactorily settled.

81. *Lecane intrasinuata* (Olofsson, 1917)
Figure 289

Synonyms: *L. ephestra* Harring, 1921
?*L. mylacris* Harring & Myers, 1926

Olofsson 1917 p. 281 fig. 11 (*Cathypa intrasinuata*); Harring 1921 p. 7 plate 3 figs 1-3 (*L. ephestra*); Harring & Myers 1926 p. 357-358 plate 24 figs 5, 6 (*Lecane intrasinuata*); p. 359-360 plate 25 figs 5, 6 (*L. mylacris*); Hauer 1935b p. 82 figs 1a,

b; Tarnogradski 1961b p. 43 figs 21, 22; Kutikova 1970 p. 445 fig. 594; Koste 1978 p. 229-230 plate 75 figs 8a-d (partim, sub. *L. stichaea* f. *intrasinuata*); Koste & Shiel 1990 p. 33 plate 15 fig. 3 (*L. stichaea intrasinuata*).

Type locality
Pond near Alexandrowsk, mouth of Kolafjord, Norway.

Differential diagnosis
L. intrasinuata differs from *L. stichaea* by its nearly smooth lorica and relatively greater width (ventral plate width about two thirds of length), from *L. flexilis* by its projecting foot pseudosegment and different shape of caudal edge of ventral plate. The presence of pseudoclaws distinguishes the species from *L. haliclysta*, *L. stichoclysta* and *L. verecunda*.

Description
Lorica stiff. Dorsal plate anteriorly narrower, medially wider than ventral plate, smooth. Lateral sulci shallow. Head aperture margins dorsally and ventrally slightly convex or straight, coincident, with small antero-lateral spines. Ventral plate longer than wide, with incomplete transverse and longitudinal folds, smooth. Lateral margins curved, irregularly undulate, with anterior notches. Foot plate with rounded or indistinct coxal plates, prepedal fold narrow, elongate, distally with median projection. Foot pseudosegment as wide as long, nearly parallel-sided, projecting. Toes parallel-sided, bearing pseudoclaws.

Measurements: DPl. 61-145, DPw. 75-108, VPl. 63-130, VPw. 41-82, toe l. 19-38, claw l. 5-7.

Distribution
Insufficiently known due to confusion with *L. stichaea*. Reliable illustrated records are from the northern temperate zone only.

82. *Lecane spiniventris* Segers, 1994
Figs 55-56, 295-297

Segers 1994 p. 246-247 figs 3a-e

Type locality and types
Roadside pond along Sungai Akar Road, close to Bandar Seri Bagawan, the Sultanate of Brunei. Holotype and paratypes in BM, paratypes in KBIN, paratypes in RUG.

Differential diagnosis
The presence of pairs of ventral and subantero-lateral spines is unique to this species, it can therefore not be confused with any congener.

Description
Lorica relatively soft, easily deformed. Dorsal plate wider than ventral plate, smooth or with irregular folds. Head aperture margins coincident, straight or slightly deformed. Antero-lateral corners rounded. Ventral plate slightly longer than wide, with

incomplete transverse and longitudinal folds. A pair of ventro-posterior spines as prolongations of the longitudinal folds present. Lateral margins of ventral plate smooth or irregularly undulate, nearly parallel-sided, with anterior notches. A pair of subanterior, forward-directed spines present, these can be hidden in the lateral sulci, but can also project. Lateral sulci shallow. Foot plate broad, rounded posteriorly, coxal plates indistinct. Prepedal fold narrow, elongate, posterior margin with median projection. Foot pseudosegment trapezoidal, not projecting. Toe single, parallel-sided in proximal half, smoothly tapering distally. A long terminal fissure present.

Measurements: DPl. 47-60, DPw. 49-59, VPl. 56-67, VPw. 43-52, subantero-lateral spine length 7-11, ventral spine l. 10-12, toe l. 27-31, fused part l. 13-16.

Distribution
A single record from the type locality only.

83. *Lecane agilis* (Bryce, 1892)
Figs 298-300

Bryce 1892 p. 273 text fig. (*Distyla agilis*); Harring 1913a p. 60 (*Lecane agilis*); Harring & Myers 1926 p. 382-383 plate 32 figs 1, 2; Korde 1927 p. 79-80 figs 4-6, Hauer 1929 p. 152 fig. 9, Kutikova 1970 p. 463 fig. 641; Wulfert 1960 p. 279 figs 16a-i; Koste 1978 p. 236 plate 78 figs 1a-i, 2a-c.

Type locality
Epping forest, U.K.

Differential diagnosis
This small species is characterised by its soft lorica, and shape and basal fusion of its toes. By these, it cannot be confused with any other *Lecane*.

Description
Illoricate *Lecane*. Living animal elongate, slightly longer than wide when contracted, with almost straight anterior edges. Foot pseudosegment small, simple, not projecting. No coxal plates. Toes characteristic: fused over basal third, broadest medially, tapering to a point distally. No claws.

Measurements: Tot. l. 55-60, lorica l. 45-70, w. 30-56, toe l. 12-18.

Distribution
Cosmopolitan, between submerged mosses in acid waters.

Note
The related *L. bryophila* Koniar, 1957 (figure 301) is known from between *Sphagnum* in the Tatra mountains, Slovakia, only. The species differs from *L. agilis* in having toes, terminating in relatively long, unilaterally separated pseudoclaws.

Measurements: Lorica l. 55, toe l. 17.

84. *Lecane kluchor* Tarnogradski, 1930
Figs 302-303

Synonym: *L. diadema* Hauer, 1931

Tarnogradski 1930 p. 122 figs 6-7; Hauer 1931 p. 7-8 figs 1a, b (*L. diadema*); Hauer 1935a p. 263; Tarnogradski 1961b p. 35 figs 23-24, Kutikova 1970 p. 463 fig. 642; Koste 1978 p. 237-238 plate 78 figs 5, 7a, b, 8.

Type locality
Kluchor pass, Caucasus mountains.

Differential diagnosis
L. kluchor can hardly be confused with any other *Lecane*. The species appears related to *L. hornemanni* or *L. latissima*, but is distinguished by its toes being fused and swollen basally. The species is closest to *L. syngenes*, but the latter has its toes fused over more than half their length. *L. kluchor* is palaearctic, whereas *L. syngenes* is a warm-stenotherm, occurring in tropical and subtropical waters.

Description
Lorica relatively soft. Dorsal plate wider than ventral plate, smooth or slightly ornamented. Head aperture margins nearly coincident, straight or slightly convex, with rounded corners. Ventral plate slightly longer than wide, transverse fold complete. Lateral margins smooth, curved. Lateral sulci deep. Foot plate broad, coxal plates rounded triangular. Prepedal fold short, broad, posterior margin rounded. Foot pseudosegment widest distally, not projecting. Toes fused and constricted basally, widest in the basal third than tapering. Short pseudoclaws and minute accessory claws present.

Measurements: DPl. 101-112, DPw. 97-110, VPl. 106-119, VPw. 72-90, toe l. 36-44, claw. l. 4.5-5.5.

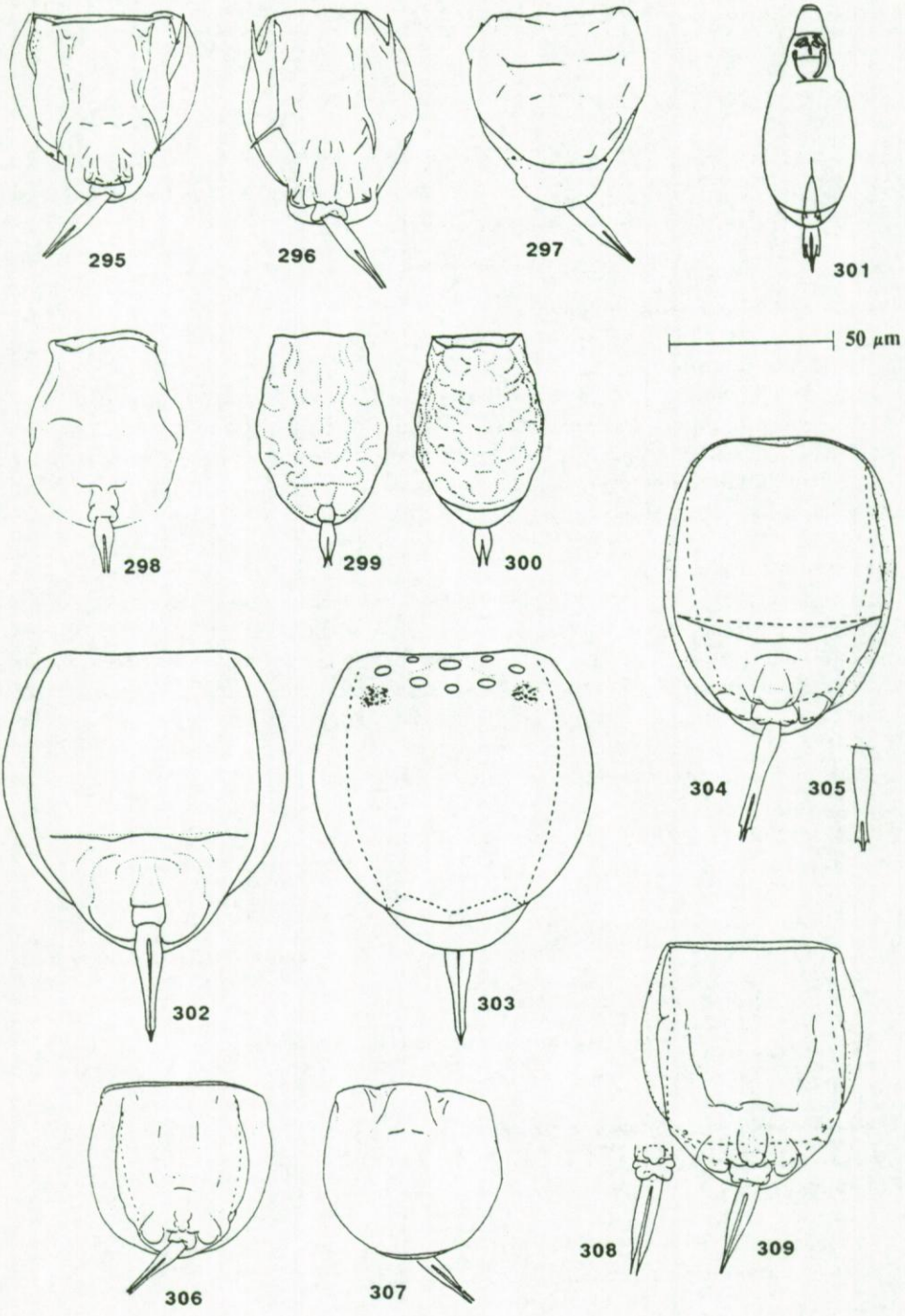
Distribution
L. kluchor is recorded from Europe and the Caucasus region. The species is rare.

85. *Lecane syngenes* (Hauer, 1938)
Figs 304-305

Hauer 1938 p. 547-548 figs 69a, b (*Monostyla syngenes*); Koste 1972 p. 399 plate 27 fig. 1 (*L. (M.) syngenes*); Koste 1978 p. 238 plate 78 figs 10a-e (*L. (H.) kluchor* var. *syngenes*); Sharma 1979 p. 57 figs 11, 12.

Type locality
Lake Toba and near Pajakumba, Sumatra (Hauer, 1937).

Differential diagnosis
L. syngenes can be distinguished from *L. kluchor* by its toes being fused over more than half their length.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309

Description
Lorica relatively soft. Dorsal plate wider than ventral plate, smooth or slightly ornamented. Head aperture margins nearly coincident, straight or slightly convex dorsally, ventrally with shallow median sinus. Antero-lateral corners rounded. Ventral plate slightly longer than wide, transverse fold complete. Lateral margins smooth, curved. Lateral sulci deep. Foot plate broad, coxal plates rounded triangular. Prepedal fold short, broad, posterior margin rounded. Foot pseudosegment widest distally, not projecting. Toe constricted basally, then dilated in its basal third, with a long terminal fissure. Short pseudoclaws and minute accessory claws present.

Measurements: DPl. 90-95, DPw. 74-76, VPl. 92-98, VPw. 67, toe l. 39-40, claw l. 5.

Distribution
L. syngenes is a rare, warm-stenothermic Pan(sub)tropical species, recorded from Africa, Asia, India and South America.

Comments
L. kluchor and *L. syngenes* were considered synonyms by Koste (1978). In view of the consistent morphological difference and their different ecology and area, *L. syngenes* is restored at full species rank.

86. *Lecane minuta* Segers, 1994
Figs 53-54, 306-307

Segers 1994 p. 245-246 figs 2a-d

Type locality and types
Roadside pond along Sungai Akar Road, close to Bandar Seri Bagawan, the Sultanate of Brunei. Holotype and paratypes in BM; paratypes in KBIN and RUG.

Differential diagnosis
L. minuta has the general shape of *L. pyriformis*, but is easily recognised by its incompletely fused toe. It also resembles *L. uenoi*, whose toes bear distinct, completely separated claws.

←
Figs 295-297: L. spiniventris. 295-296: ventral view, 297: dorsal view.
Figs 298-300: L. agilis. 298-299: ventral view, 300: dorsal view.
Fig. 301: L. bryophila, ventral view.
Figs 302-303: L. kluchor. 302: ventral view, 303: dorsal view.
Figs 304-305: L. syngenes, ventral view. 305: toe.
Figs 306-307: L. minuta. 306: ventral view, 307: dorsal view.
Figs 308-309: L. paradoxa, ventral view. 308: toe.
(295-297, 306-307: after Segers, 1994; 298, 304-305: Nigeria (Segers *et al.*, 1993a); 299-300: after Harring & Myers, 1926; 301: after Koniar, 1957; 302-303: after Hauer, 1931 (sub. *L. diadema*); 308-309: Saudi Arabia (Segers & Dumont, 1993b)).

Description
Lorica stiff. Dorsal plate as wide as long, wider than ventral plate, smooth or with some irregular folds. Head aperture margins coincident, straight or slightly convex, antero-lateral corners rounded or angulate. Ventral plate longer than wide, smooth, with incomplete transverse and longitudinal folds. Lateral margins smooth or irregularly undulate, slightly curved or nearly straight. Lateral sulci shallow, more pronounced in the posterior part. Foot plate broad, rounded posteriorly, coxal plates rounded. Prepedal fold narrow, elongate, with median projection. Foot pseudosegment simple, not projecting. Toes fused over basal half, parallel-sided basally, tapering from medially onwards.

Measurements: DPl. 51-54, DPw. 50-61, VPl. 46-52, VPw. 38-42, toe l. 24-28, fused part l. 7-9.

Distribution
A single record from the type locality only.

87. *Lecane paradoxa* (Steinecke, 1916)
Figs 308-311

Synonyms: *L. ozensis* Yamamoto, 1953 (n. syn.)
L. hoffmanni De Ridder, 1960

Steinecke 1916 p. 89-90 fig. 3 (*Monostyla lunaris* f. *paradoxa*); Steinecke 1924 p. 41 (*M. paradoxa*); Yamamoto 1953 p. 17-18 figs 3, 4 (*L. ozensis*); Voigt 1957 p. 228 plate 43 fig. 1 (*Lecane paradoxa*); De Ridder 1960 p. 171-173 figs 3a, b (*L. hoffmanni*); Kutikova 1970 p. 463 fig. 643 (*L. (H.) paradoxa*); Koste 1978 p. 236-237 plate 78 figs 6a-d.

Type locality
'Neulinum, Westpreußen'

Differential diagnosis
L. paradoxa can be confused with *L. inconspicua*, but its dorsal plate is anteriorly as wide as the ventral, and it lacks distinct claws. The species differs from *L. nana* by the different shape of its toe tips and by its basally swollen toes.

Description
Lorica relatively soft. Dorsal plate anteriorly slightly, medially distinctly wider than ventral plate, smooth. Head aperture margins coincident, straight, antero-lateral corners angulate. Ventral plate longer than wide, with incomplete transverse and longitudinal folds, occasionally weakly ornamented. Lateral margins smooth, curved. Lateral sulci deep, especially in posterior region. Foot plate broad, with rounded coxal plates. Prepedal fold narrow, distally with median projection. Foot pseudosegment mostly projecting. Toes fused basally, variably swollen in their basal third, occasionally nearly parallel-sided. Toe tips with sharp points, no distinct claws.

Measurements: DPl. 62-70, DPw. 62-67, VPl. 50-75, VPw. 45-52, toe l. 27-40.

Distribution
L. paradoxa is a rare, probably Palaearctic species, recorded from Europe (France, Germany), Japan and Northern Arabia. The species occurs in fresh and saline water.

Comments
The description of *L. ozensis* differs from *L. paradoxa* only in the shape of the toes, which are reported as nearly parallel-sided in *L. ozensis*. In *L. paradoxa*, they are variably swollen basally. As the character appears to be variable in this taxon, the two names are treated as synonyms.

88. *Lecane paxiana* Hauer, 1940
Figs 315-318

Hauer 1940 p. 156-158 figs 1a-c; Koste 1978 p. 237 plate 78 figs 3a-e.

Type locality
Bad Wildstein, F.R.G.

Differential diagnosis
L. paxiana can be confused with *L. nana*, but differs from it by its toes bearing distinct claws. The species differs from *L. inconspicua* by its different head aperture shape, and softer lorica.

Description
Lorica stiff. Dorsal plate anteriorly slightly wider than or as wide as ventral plate, medially wider than ventral plate, smooth. Head aperture margins nearly coincident, straight or slightly convex, antero-lateral corners angulate. Ventral plate slightly longer than wide, with incomplete transverse and longitudinal folds, occasionally ornamented. Lateral margins smooth, curved, with smooth lateral notches anteriorly. Lateral sulci shallow. Foot plate broad, rounded posteriorly, coxal plates rounded triangular. Prepedal fold narrow, elongate, distally with median projection. Foot pseudosegment simple, not or slightly projecting. Toes fused basally, bearing distinct pseudoclaws.

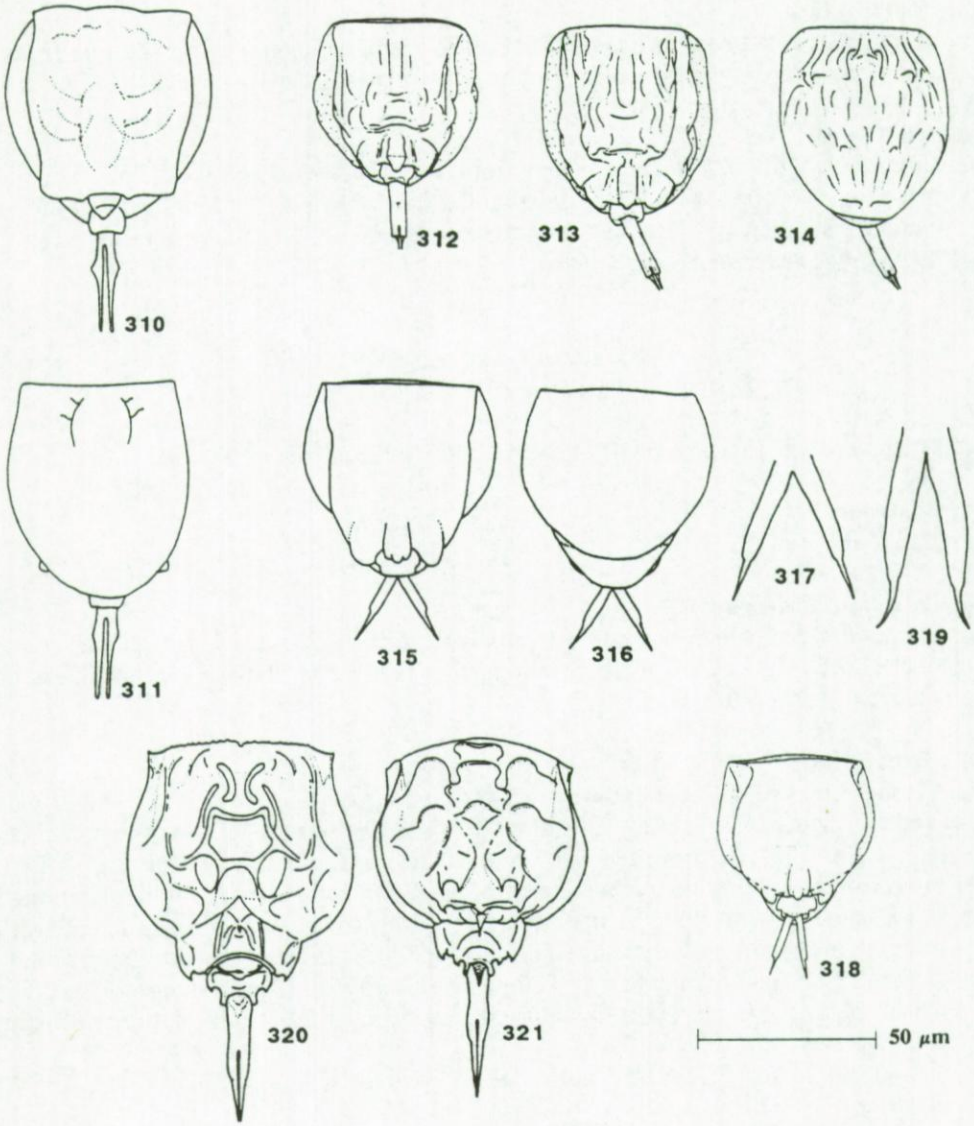
Measurements: DPl. 41-57, DPw. 47-57, VPl. 48-64, VPw. 37-50, toe l. 17-21, claw l. 5-7.

Distribution
Rare, recorded from Europe and Africa.

89. *Lecane uenoi* Yamamoto, 1951
Figs 312-314

L. rugosa after Koste (1974)

Yamamoto 1951 p. 157-158 fig. 1; Segers *et al.* 1993b p. 116-117 figs 3a-c.



Figs 310-311: L. paradoxa. 310: ventral view, 311: dorsal view.
Figs 312-314: L. uenoi. 312-313: ventral view, 314: dorsal view.
Figs 315-318: L. paxiana. 315, 318: ventral view, 316: dorsal view, 317: toes.
Fig. 319: L. nana, toes (see also figs 100-101).
Figs 320-321: L. junki. 320: ventral view, 321: dorsal view.
(310-311: after De Ridder, 1960 (sub. *L. hoffmanni*); 312-314: after Segers *et al.*, 1993b; 315-317, 319: after Hauer, 1940; 318: Nigeria (Segers *et al.*, 1993a); 320-321: after Koste, 1975).

Type locality
Rokujizo Pond, Kyoto Prefecture, Japan.

Differential diagnosis
L. uenoi, by being the only *Lecane* combining incompletely fused toes bearing completely separated claws and a consistently wider dorsal than ventral plate, is unmistakable. Confusion can occur with *L. inopinata*, which has an anteriorly narrower dorsal than ventral plate.

Description
Lorica stiff. Dorsal plate wider than ventral plate, smooth or ornamented. Head aperture margins coincident, straight or slightly convex, antero-lateral corners rounded or nearly angulate. Ventral plate slightly longer than wide, with an incomplete transverse, and longitudinal folds, smooth or ornamented. Lateral margins smooth or irregularly undulate, slightly curved or nearly straight. No pronounced lateral sulci. Foot plate broad, rounded posteriorly, coxal plates rounded. Prepedal fold narrow, elongate, distally with median projection. Foot pseudosegment simple, not or slightly projecting. Toe single, parallel-sided basally, with distinct terminal fissure. Two completely separated claws present.

Measurements: DPl. 44-53, DPw. 46-48, VPl. 47-52, VPw. 35-41, toe l. 14-18, claw l. 4-5.

Distribution
Insufficiently known. Recorded from Japan and Brazil.

90. *Lecane undulata* Hauer, 1938
Figs 322-326

L. sympoda after Hauer (1956)?

Hauer 1938 p. 526 figs 49a, b; Kutikova 1970 p. 461 fig. 638; Koste 1978 p. 239 plate 79 figs 3a, b (*L. (H.) inopinata* f. *undulata*); De Ridder 1981 p. 68-69 plate 3 fig. 11.

Type locality
Botanical garden of Buitenzorg and Ranu Lamongan, Java.

Differential diagnosis
L. undulata can be confused with *L. inopinata*. It differs from the latter by its toes being fused basally only. *L. undulata* is generally smaller than *L. inopinata*. The species also resembles *L. inconspicua*, it is distinguished by the different shape of its foot pseudosegment and completely separated claws.

Description
Lorica stiff. Dorsal plate anteriorly narrower, medially wider than ventral plate, ornamented. Head aperture margins nearly coincident or parallel, straight or irregularly undulate. Antero-lateral corners angulate. Ventral plate slightly longer than wide, with incomplete transverse and longitudinal folds, ornamented. Lateral mar-

gins smooth, straight, with or without anterior notches. Lateral sulci deep. Foot plate broad, rounded posteriorly, coxal plates rounded. Prepedal fold narrow, elongate, distally with median projection. Foot pseudosegment simple, not projecting. Toes fused basally, bearing completely separated claws.

Measurements: DPl. 48, DPw. 44, VPl. 51, VPw. 39, toe l. 17, claw l. 5.

Distribution

L. undulata is a warm-stenotherm, recorded from tropical and subtropical regions of all continents. It is uncommon.

Comments

The original diagnostic character of *L. undulata*, viz. the undulate dorsal head aperture margin, depends on the degree of contraction of the specimens, and can therefore not be confirmed.

91. *Lecane inopinata* Harring & Myers, 1926
Figs 327-332

L. sympoda after Wiszniewski (1932a), Hauer (1938), Tarnogradski (1961b), Wulfert (1966)

Harring & Myers 1926 p. 374-375 plate 32 figs 5, 6; Hauer 1956 p. 296 figs 11a-b; Kutikova 1970 p. 462 fig. 640; Koste 1978 p. 238 plate 79 fig. 5a-e (partim); Koste & Shiel 1990 p. 15 plate 7 figs 3a, b (*Hemimonostyla inopinata*).

Type locality

Ponds near Minocqua, Wisconsin, U.S.A.

Differential diagnosis

L. inopinata can be confused with *L. braziliensis*, *L. sympoda* and *L. undulata*. *L. inopinata* has its toes fused over about 40-70% of their length (basally only in *L. undulata*), has angulate antero-lateral corners (with sharp spines in *L. sympoda*), and has a relatively stout lorica, a smooth or ornamented dorsal plate and short claws (resp. elongate, with strong transverse folds and long in *L. braziliensis*).

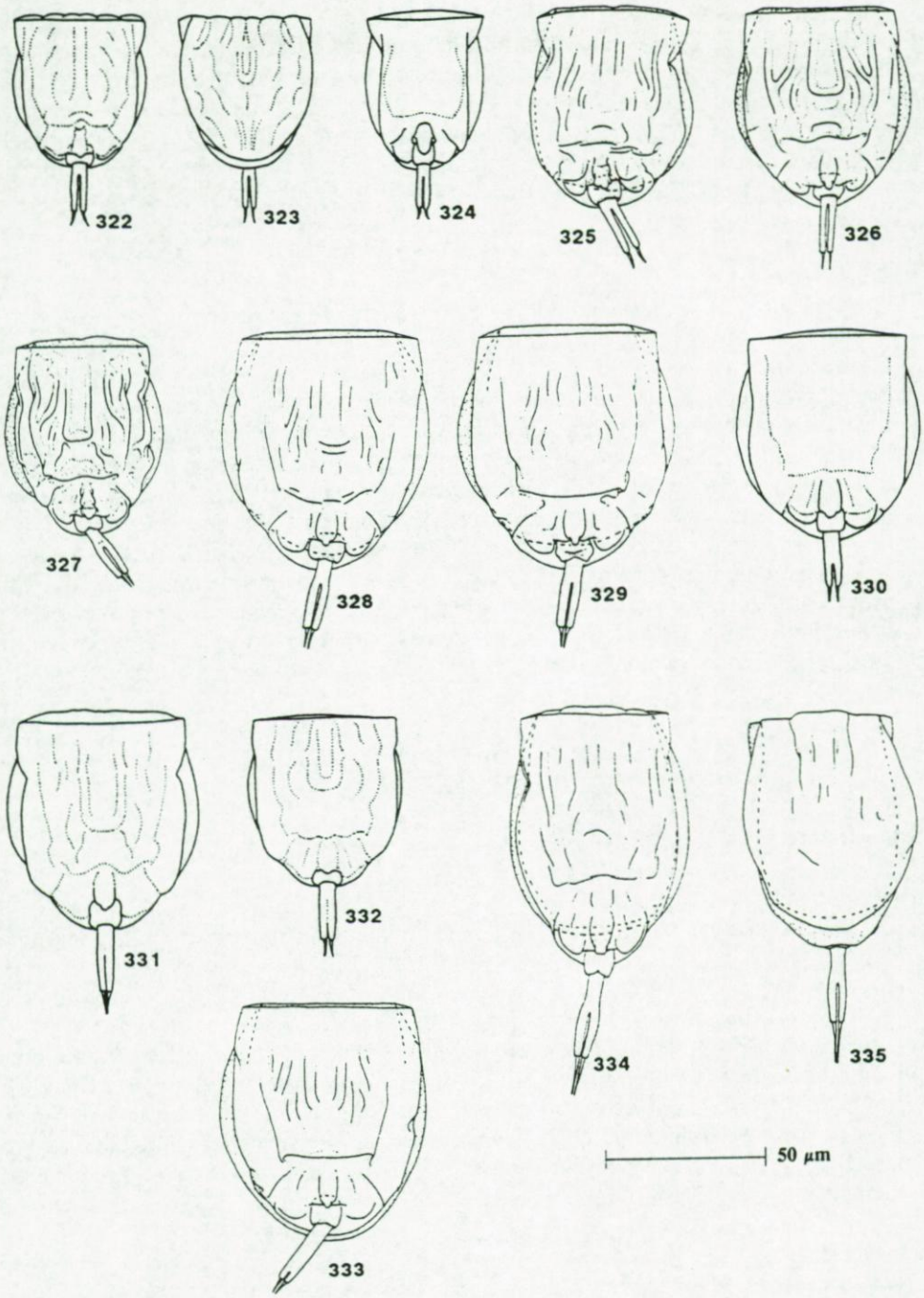
Although being related to *L. furcata*, *L. acanthinula* and *L. pusilla*, the species cannot be confused with any of these by its partly fused toes.

Description

Loricate *Lecane*. Dorsal plate anteriorly narrower, medially wider than ventral plate, smooth or ornamented. Head aperture margins nearly coincident or parallel, straight

→

Figs 322-326: L. undulata. 322, 324-326: ventral view, 323: dorsal view.
Figs 327-332: L. inopinata, ventral view.
Fig. 333: L. furcata, ventral view (see also figs 390-392).
Figs 334-335: L. braziliensis. 334: ventral view, 335: dorsal view.
(322-323, 330-332: after Hauer, 1938; 324: after Hauer, 1956; 325, 328-329, 333: Madagascar (Segers, 1992); 326, 327: Nigeria (Segers *et al.*, 1993a); 334-335: after Segers *et al.*, 1993b).


322
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50 µm

or slightly convex, antero-lateral corners angulate. Ventral plate slightly longer than wide, with incomplete transverse and longitudinal folds, occasionally ornamented. Lateral margins smooth, straight, with anterior notches. Lateral sulci deep. Foot plate broad, rounded posteriorly. Coxal plates rounded. Prepedal fold narrow, elongate, distally with median projection. Foot pseudosegment simple, not or slightly projecting. Toes fused over proximal 1/3 to 2/3, bearing short, completely separated claws.

Measurements: DPl. 56-75, DPw. 49-62, VPl. 56-80, VPw. 33-58, toe l. 14-31, claw l. 3-5.

Distribution

Cosmopolitan. A rather uncommon, warm-stenothermic species.

Comments

The degree of ornamentation of the lorica plates cannot be confirmed as a valid diagnostic character, as was suggested by the synonymy of the taxa concerned by Wiszniewski (1954) and Koste (1978)(see also comments under *L. furcata*). Small differences in degree of fusion can neither be considered diagnostic, as some variability in the expression of the character is evident. This is further exemplified by *L. furcata*, a species that can have toes with or without terminal fissure (e.g., figure 333). The only character differentiating between *L. inopinata* and *L. sympoda* is the presence of antero-lateral spines in the latter, similarly as between *L. furcata* and *L. acanthinula*. This, however, needs confirmation. Following the present diagnosis, most records of *L. sympoda* concern *L. inopinata*.

92. *Lecane braziliensis* Segers, 1993
Figs 18, 334-335

Segers *et al.* 1993b p. 114-116 figs 1a-c.

Type locality and types

Pond on Maracá Island, Roraima, Brazil. Holotype and paratypes in INPA, paratypes in RUG.

Differential diagnosis

L. braziliensis is closest to *L. inopinata*. The species is characterised by the great length of its claws (8-14 µm, versus 3-5 µm in *L. inopinata* and *L. undulata*, and 5-7 µm in *L. sympoda*), by the pair of conspicuous longitudinal folds in the anterior region of the dorsal plate and by its elongate lorica. The species has angulate antero-lateral corners (with sharp projections in *L. sympoda*) and toes, fused over about half their length (fused basally in *L. undulata*).

Description

Loricate *Lecane*. Dorsal plate anteriorly narrower, medially wider than ventral plate, with a pair of longitudinal folds and some irregular ornamental folds. Head aperture margins nearly coincident, straight, dorsally with slightly protruding median part, antero-lateral corners angulate. Ventral plate longer than wide, with incomplete transverse and longitudinal folds, ornamented. Lateral margins smooth, straight,

nearly parallel, with anterior notches. Lateral sulci deep. Foot plate relatively narrow, coxal plates rounded or irregularly deformed through fixation. Prepedal fold narrow, elongate, posterior margin with median projection. Foot pseudosegment simple, not or slightly projecting. Toes fused over proximal half, slightly dilated from medially onwards. Claws completely separated, slightly less than half as long as the toes.

Measurements: DPl. 67-74, DPw. 46-57, VPl. 69-79, VPw. 43-50, toe l. 24-27, claw l. 9-14.

Distribution
Known from the type locality, from a temporary lagoon 5 km. S of Boa Vista, Roraima, Brazil and from Rio Miranda, Pantanal region of Brazil.

93. *Lecane junki* Koste, 1975
Figs 320-321

Koste 1975 p. 49-50 figs 1, 2 (*L. (H.) junki*); Koste 1978 p. 239 plate 79 fig. 11a, b

Type locality
Bung-Borapet lake, Thailand.

Differential diagnosis
This small species can, by its differentiated foot plate, foot pseudosegment and toe, hardly be confused with any other *Lecane*.

Description
Lorica stiff. Dorsal plate narrower than ventral plate, ornamented. Head aperture margins nearly coincident, slightly convex. Antero-lateral corners angulate. Ventral plate only slightly longer than wide, ornamented. Lateral margins smooth, curved. Lateral sulci deep. Foot plate broad, clearly separated, bearing a pair of claw-like extensions. Coxal plates inconspicuous. Prepedal fold narrow, elongate, distally with median projection. Dorsal plate with short posterior spines. Foot pseudosegment projecting, relatively broad, with sharp lateral extensions. Toes fused up to medially, claws incompletely separated.

Measurements: DPl. 43, DPw. 44, VPl. 56, VPw. 48, ant. edge width 46, toe l. 16, claw l. 13.

Distribution
A single record from the type locality.

94. *Lecane dumonti* Segers, 1993
Figs 61, 336-338

Segers 1993 p. 53-54 figs 12a-b; Segers *et al.* 1993b p. 116 fig. 2.

Type locality and types
Swamp in mouth of Njaba river, Oguta Lake, Imo State, Nigeria. Holotype and paratypes in MRAC, paratypes in RUG.

Differential diagnosis
Lecane dumonti superficially resembles *L. inopinata*, but its unusually strong pattern of ridges ventrally and dorsally, the row of minute spicules on the inner side of the head aperture, the shape of the foot pseudosegment, and the relatively long claws distinguish the species.

Description
Lorica with domed dorsal and flat ventral plate. Dorsal plate anteriorly narrower, medially wider than ventral plate, with a strong pattern of ornamental ridges. Head aperture margin dorsally slightly convex, ventrally straight, with rows of minute spicules on inner side. Ventral plate slightly longer than wide, with an incomplete transverse and longitudinal folds, strongly ornamented. Lateral margins smooth, nearly parallel. Lateral sulci deep. Foot plate broad, with complicated pattern of folds. Prepedal fold narrow, elongate, posterior margin with median projection. Coxal plates inconspicuous. Foot pseudosegment not projecting, expanded distally, with lateral lobes. Toes fused basally. Claws relatively long.

Measurements: DPl. 56-69, DPw. 50-67, VPl. 59-71, VPw. 49-65, toe l. 23-25, fused part l. 9-13, claw l. 8-14.

Distribution
Known from the type locality and from Brazil. A rare species.

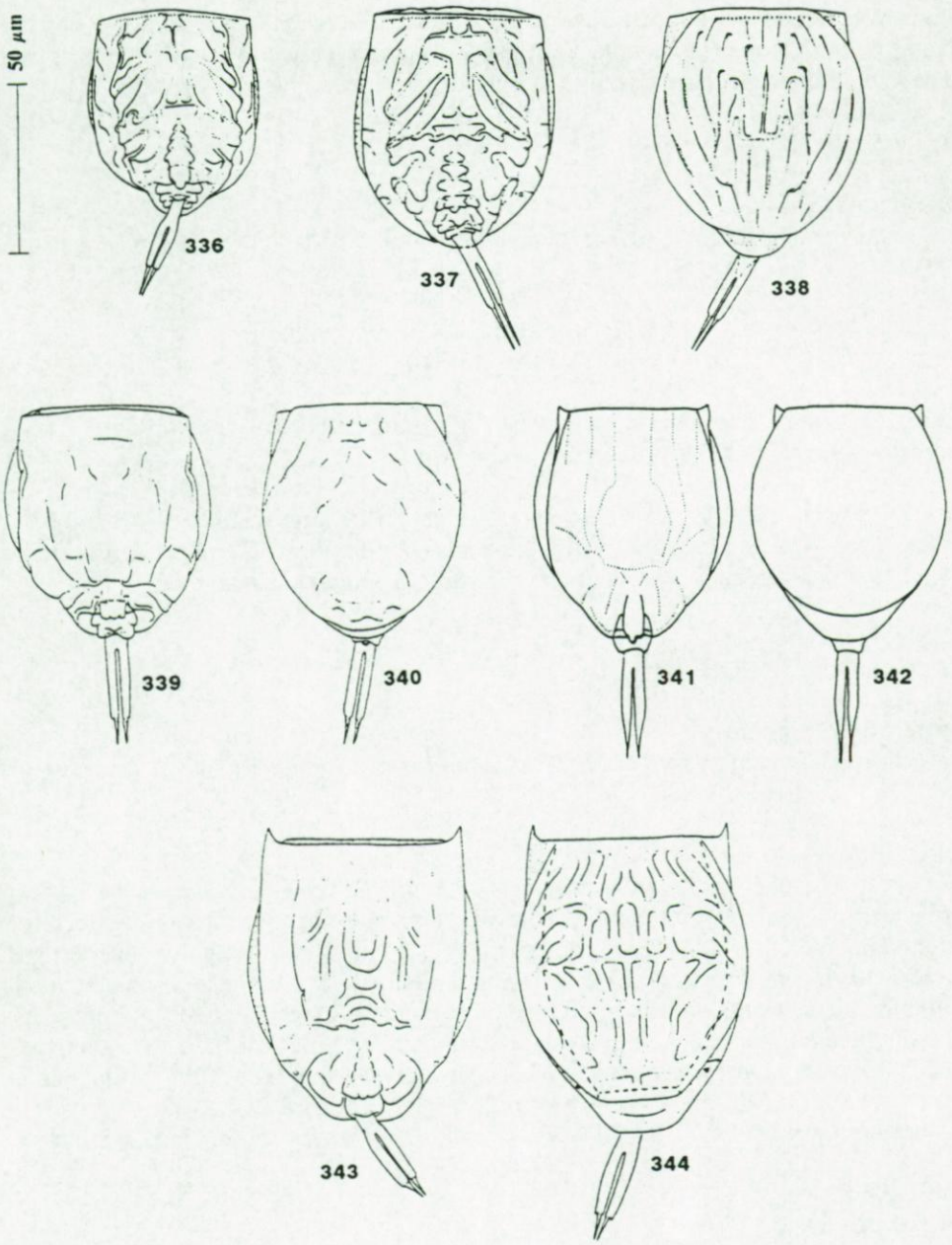
95. *Lecane inconspicua* Segers & Dumont, 1993
Figs 339-340

Segers & Dumont 1993b p. 19 figs 11a, b.

Type locality and types
Pond at Sabkhat Al Fasal, Jubail, Saudi Arabia. Holotype in KBIN, paratypes in SNMNH and RUG.

Differential diagnosis
L. inconspicua is close to *L. elasma*, but is distinguished by its toes bearing distinct, though incompletely separated claws and angulate antero-lateral corners. It differs from *L. paradoxa* by its distinct claws, parallel-sided toes (mostly bulged medially in *L. paradoxa*) and its dorsal plate, being narrower than the ventral anteriorly.

Description
Lorica relatively soft. Dorsal plate anteriorly narrower, medially wider than ventral plate, some folds present. Dorsal head aperture margin projects slightly, both dorsal and ventral straight. Antero-lateral corners angulate. Lateral sulci deep. Ventral plate longer than wide, with weak pattern of incomplete transverse and longitudinal folds, weakly ornamented. Lateral margins straight, nearly parallel, with anterior notches.



Figs 336-338: L. dumonti. 336-337: ventral view, 338: dorsal view.
Figs 339-340: L. inconspicua. 339: ventral view, 340: dorsal view.
Figs 341-342: L. elasma. 341: ventral view, 342: dorsal view.
Figs 343-344: L. sympoda. 343: ventral view, 344: dorsal view.
(336: after Segers *et al.*, 1993b; 337-338: after Segers, 1993; 339-340: after Segers & Dumont, 1993b; 341-342: after Hauer, 1929; 343-344: Nigeria (Segers, 1993)).

Foot plate broad, with inconspicuous coxal plates. Prepedal fold narrow, elongate, distally with median projection. Foot pseudosegment projecting, with lateral lobes. Toes parallel-sided, fused basally, bearing distinct, incompletely separated claws.

Measurements: DPl. 60-72, DPw. 54-63, VPl. 65-73, VPw. 48-55, anterior edge w. 49-51, toe l. 24-27, claw l. 5-8.

Distribution
Known from several localities in the East of Saudi Arabia.

96. *Lecane sympoda* Hauer, 1929
Figs 343-344

non *L. sympoda* after Wiszniewski (1932a), Hauer (1938), Hauer (1956), Tarnogradski (1961b), Wulfert (1966).

Hauer 1929 p. 152-154 figs 10a, b (*L. (H.) sympoda*); Kutikova 1970 p. 461 fig. 639; Koste 1978 p. 238-239 plate 79 figs 2a-e (*L. (H.) inopinata* f. *sympoda*); Koste & Shiel 1990 p. 15 plate 7 figs 4a, b (*Hemimonostyla inopinata sympoda*).

Type locality
Near Karlsruhe, F.R.G.

Differential diagnosis
L. sympoda is distinguished from *L. inopinata* and *L. undulata* by the presence of sharp antero-lateral spines.

Description
Lorica stiff. Dorsal plate anteriorly narrower, medially wider than ventral plate, ornamented. Head aperture margins nearly coincident or parallel, straight or dorsally slightly convex. Antero-lateral spines present. Ventral plate slightly longer than wide, with incomplete transverse and longitudinal folds, ornamented. Lateral margins smooth, straight, with or without anterior notches. Lateral sulci deep. Foot plate broad, rounded posteriorly, coxal plates rounded. Prepedal fold narrow, elongate, distally with median projection. Foot pseudosegment simple, not projecting. Toes fused over proximal third or half, bearing completely separated claws.

Measurements: DPl. 77-83, DPw. 65-69, VPl. 76-87, VPw. 53-63, toe l. 25, claw l. 6-7.

Distribution
Verified illustrated records are from Germany and Nigeria only.

Comments
See under *L. inopinata*.

97. *Lecane elasma* Harring & Myers, 1926
Figs 341-342

L. nana after Hauer (1924)

Harring & Myers 1926 p. 345-346 plate 20 figs 1, 2; Hauer 1929 p. 151-152 figs 8a, b; Wulfert 1940 p. 574 figs 14a-e; Koste 1978 p. 237 plate 79 figs 1a-h.

Type locality
Washington; District of Columbia; Tuckerton, New Jersey; North and Central Wisconsin, U.S.A.

Differential diagnosis
Lecane elasma has been confused with *L. nana*. It differs from this species by its relatively long toe points, soft lorica, and projecting foot pseudosegment. *L. inconspicua* may be its closest relative; the latter has distinct claws and angulate antero-lateral corners. *L. elasma* differs from *L. paradoxa* by the presence of antero-lateral spines, and by the dorsal plate being narrower than the ventral anteriorly.

Description
Lorica relatively soft. Dorsal plate anteriorly narrower, medially wider than the ventral plate, smooth. Head aperture margins coincident, straight, small antero-lateral spines present. Ventral plate longer than wide, with an incomplete transverse and longitudinal folds, weakly ornamented. Lateral margins smooth, nearly parallel. Lateral sulci shallow. Foot plate broad, with rounded triangular coxal plates. Prepedal fold narrow, elongate, posteriorly with median projection. Foot pseudosegment simple, projecting. Toes fused basally, parallel-sided up to medially, ten tapering to sharp points, no claws.

Measurements: DPl. 58-75, DPw. 55-65, VPl. 64-85, VPw. 48-56, ant. edge w. 35-46, toe l. 32-40.

Distribution
Known from the U.S.A. and Europe. The species lives between submerged mosses in acid waters.

98. *Lecane blachei* Bērziņš, 1973
Figs 345-347

Bērziņš 1973 p. 454 figs 6-8; Koste 1978 p. 239 plate 79 figs 9a-c (*L. (H.) blachei*); Koste 1988a p. 118 figs 22a, b; Sarma 1988 p. 266 figs 14a-b.

Type locality
Delta of Mekong River, Cambodia.

Differential diagnosis
L. blachei is related to *L. unguitata*, but is easily distinguished by its incompletely fused toes. The species is closest to *L. nwadiaroi*, from which it differs by its toe being fused basally only and rounder lorica.

Description
Lorica stiff. Dorsal plate nearly as wide as ventral, round, with weak pattern. Head aperture margin dorsally straight, ventrally concave, with characteristic antero-lateral projections. Ventral plate rounded, transverse fold complete, ornamented. Foot plate broad, coxal plates small, rounded triangular. Foot pseudosegment trapezoidal, non-projecting. Prepedal fold broad, short, posterior margin smoothly rounded. Toes relatively short, fused basally. Fissure between toes distinct medially, narrow distally. Pseudoclaws relatively long, touching together, accessory claws present.

Measurements: DPl. 104-109, DPw. 104-110, VPl. 127-130, VPw. 110-114, toe l. 30-40, claw l. 10-15.

Distribution
Cambodia; E-Kalimantan, Indonesian Borneo; Calcutta, India and Thailand. A rare, apparently Oriental species.

99. *Lecane nwadiaroi* Segers, 1993
Figs 348-349

Segers 1993 p. 54-55 figs 15a, b.

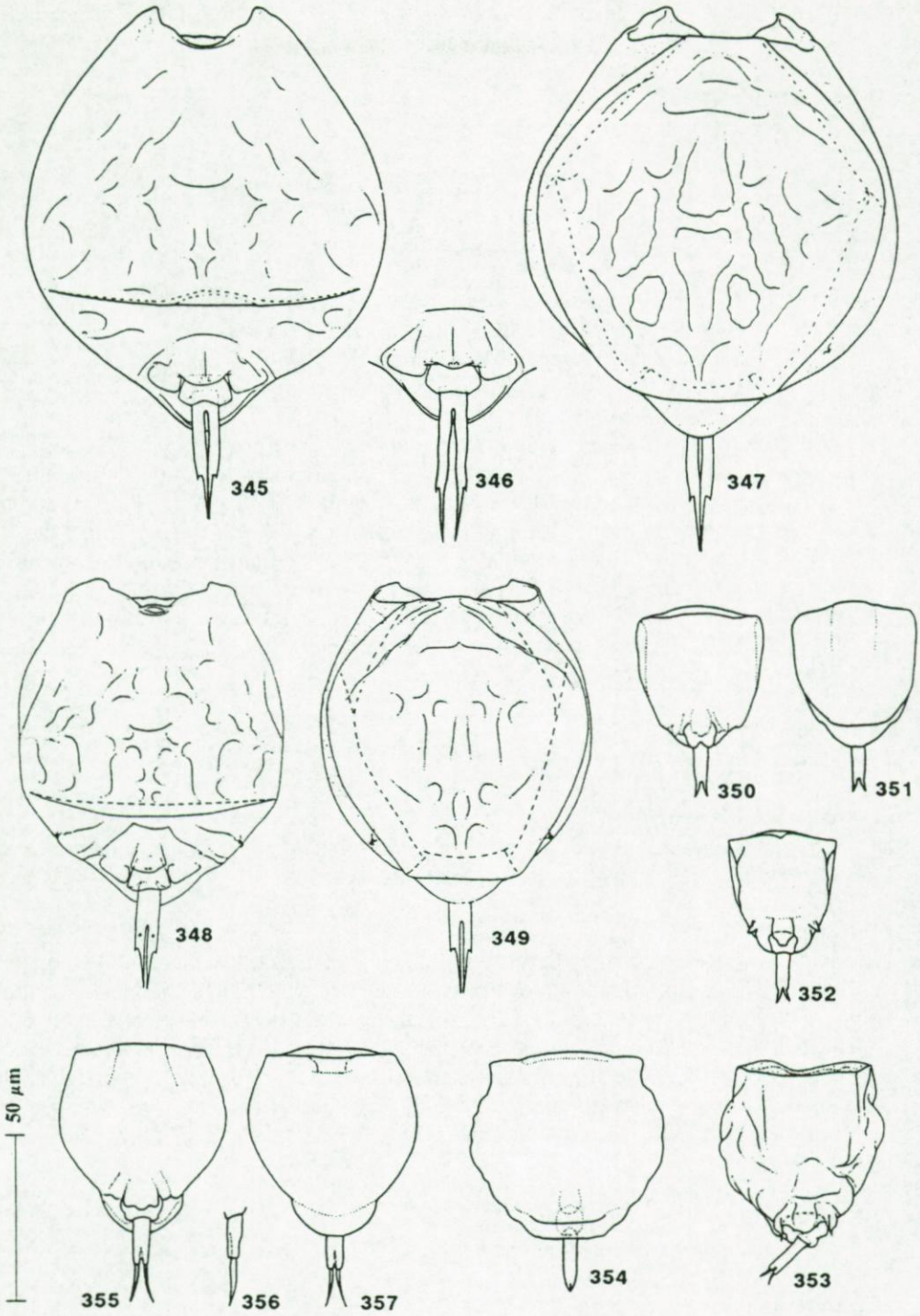
Type locality and types
Lake Iyi-Efi, Imo State, Nigeria. Holotype and paratypes in MRAC, paratypes in RUG.

Differential diagnosis
L. nwadiaroi differs from *L. blachei* by its toes being fused up to medially instead of basally only, and by its more angulate lorica.

Description
Lorica stiff. Dorsal plate nearly as wide as ventral, round, with weak pattern of folds. Head aperture margin dorsally straight or with shallow median dome, ventrally with median sinus and characteristic antero-lateral extensions. Ventral plate slightly longer than wide, ornamented. Transverse fold complete. Lateral sulci deep. Foot plate broad, with small, rounded triangular coxal plates and trapezoidal, non-projecting foot pseudosegment. Prepedal fold broad, short, posterior margin smoothly rounded. Toes relatively short, fused over their basal half. Pseudoclaws relatively long, accessory claws present.

→

Figs 345-347: L. blachei. 345-346: ventral view, 346: foot plate and toe, compressed, 347: dorsal view.
Figs 348-349: L. nwadiaroi. 348: ventral view, 349: dorsal view.
Figs 350-353: L. bifurca. 350, 352-353: ventral view, 351: dorsal view.
Fig. 354: L. dysoarata, ventral view.
Figs 355-357: L. solfatara. 355: ventral view, 356: toe, lateral view, 357: dorsal view.
(345-347: Nong Han Lake, Sakon Nakhon, Thailand; 348-349: after Segers, 1993; 350-351: after Hauer, 1938 (sub. *Monostyla crypta*); 352: after Hauer, 1940 (sub. *M. crypta*); 353: Easter island (Segers & Dumont, 1993a); 355-357: after Hauer, 1938).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347
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349
350
351
352
50 µm
355
356
357
354
353

Measurements: DPl. 84-86, DPw. 74-84, VPl. 88-93 (+ antero-lateral projections: + 7-9), VPw. 81-84, toe l. 19-22, fused part l. 13-15, claw l. 14-15.

Distribution
A single record from the type locality only.

100. *Lecane bifurca* (Bryce, 1892)
Figs 350-353

Synonyms: *Monostyla monostylaeformis* (Stenroos, 1898) Iroso, 1910
Lecane fusilis Myers, 1936c (n. syn.)
Lecane crypta (Hauer, 1938) Voigt, 1957
Lecane bifurca entome Bērziņš, 1982a (n. syn.)

Bryce 1892 p. 274 text fig. (*Monostyla bifurca*); Stenroos 1898 p. 126 fig. 25 (*Notommata monostylaeformis*); Iroso 1910 p. 303; Fadeev 1925 p. 23 fig. 8 (*M. monostylaeformis*); Harring & Myers 1926 p. 416 plate 44 figs 1, 2; Myers 1936c p. 83-84 fig. 1 (*L. fusilis*); Hauer 1938 p. 538-539 fig. 61a, b (*Monostyla crypta*); Carlin 1939 p. 27 fig. 8a, b; Hauer 1940 p. 158 fig. 2 (*M. crypta*); Myers 1942 p. 263 (*Lecane bifurca*); Voigt 1957 p. 236 plate 42 fig. 4; Kutikova 1970 p. 479 fig. 684; Koste 1978 p. 241 plate 79 figs 10a, b (var. *crypta*); plate 80 figs 1a, b; Bērziņš 1982a p. 9 fig. 26 (*L. (M.) bifurca entome*); Koste & Shiel 1990 p. 4 plate 1 figs 4a-c (*Monostyla bifurca*, incl. *M. bifurca entome*).

Type locality
Ditch near Sandown Waterworks, U.K.

Differential diagnosis
The species is unmistakable by its soft lorica, presence of coxal spines and by its single toe bearing completely separated, diverging claws.

Description
Illoricate *Lecane*. Body easily deformed, shape inconsistent. Living animal elongate, only slightly longer than wide when contracted. Coxal plates elongate, acutely pointed terminally, not or distinctly projecting. Prepedal fold narrow, elongate, posteriorly with median projection. Foot pseudosegment large, broadest basally, not or scarcely projecting. Relatively short, parallel-sided toe, occasionally with terminal fissure. Two completely separated, diverging claws present.

Measurements: Tot. l. (contracted) 62-75, Lo. l. 48-58, Lo. w. 42-58, toe l. 15-19, claw l. 3-5.

Distribution
L. bifurca is a common, cosmopolitic species.

Comments
L. bifurca entome is, judging from its description and figure, based on an irregularly contracted individual. The taxon is here treated as a synonym.

The coxal plates may or may not project, and are at times inconspicuous (e.g., Figs 350-351). *L. fusilis*, which was diagnosed mainly by its 'obtusely pointed coxal plates', is therefore considered a synonym.

Note
A similar species, only known from Half-moon Pond, Monroe County and Lake Tamaque; U.S.A., is *L. dysoarata* Myers, 1942 (figure 354, type in PANS). It differs from *L. bifurca* by the tip of its toes being tapered, presenting a short terminal fissure only.

Measurements: Total length: 60, toe l. 15.

101. *Lecane solfatara* (Hauer, 1938)
Figs 355-357

Hauer 1938 p. 546-547 figs 68a-c (*Monostyla solfatara*); Wiszniewski 1954 p. 71 (*Lecane solfatara*).

Type locality
Near Sigaol, Sumatra.

Differential diagnosis
L. solfatara resembles *L. bifurca*, but is easily distinguished by its relatively long claws and by its normal coxal plates.

Description
Illoricate *Lecane*. Contracted animal slightly longer than wide, anterior edges straight or convex, lorica shape inconsistent. Foot pseudosegment relatively broad, projecting. Toe single, parallel-sided, relatively short with terminal fissure. Two completely separated, diverging long claws present.

Measurements: Tot. l. 83, Lo. l. 60, Lo. w. 53, toe l. 14, claw l. 13.

Distribution
A single record from the type locality.

102. *Lecane bulla* (Gosse, 1851)
Figs 24, 37-39, 358-365

Synonyms: *L. bipes* (Stokes, 1896)
L. incisa (Daday, 1897)
L. styrax (Harring & Myers, 1926) Wiszniewski, 1954
L. goniata (Harring & Myers, 1926) Myers, 1942
L. styrax longistyla (Weisig, 1928) Kutikova, 1970
L. physalis Wulfert, 1939 (n. syn.)
L. ozolini (Bērziņš, 1943) Kutikova, 1970 (n. syn.)
L. bulla kutikovae Naberezhniyi & Irmasheva, 1975 (n. syn.)
L. bulla diana Abdullaev, 1989 (n. syn.)

L. bulla constricta (Sudzuki, 1992) (n. syn.)
L. bulla dentata (Sudzuki, 1992) (n. syn.)

L. lunaris after Brandorff *et al.* (1982)

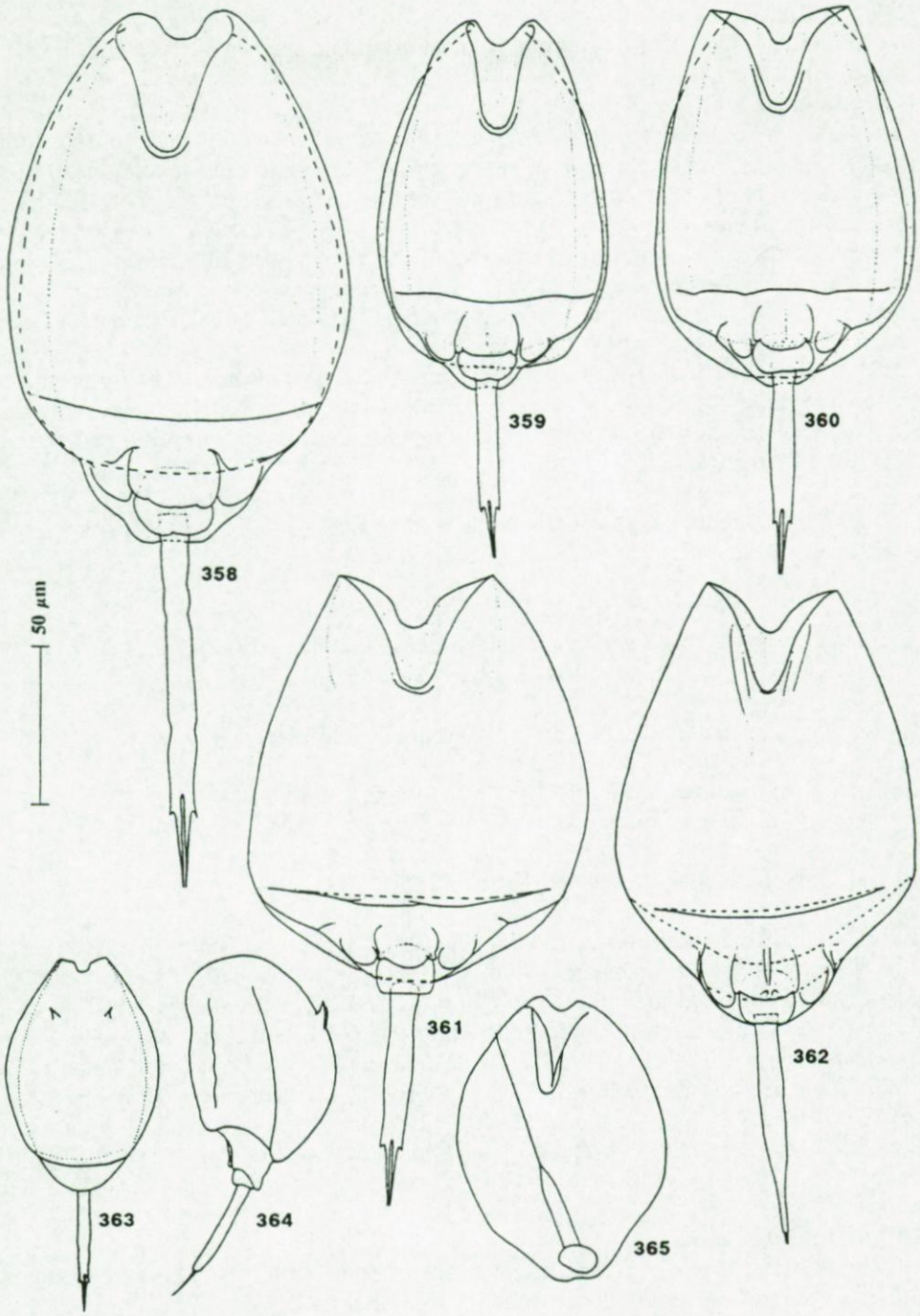
Infrasubspecific taxa: var. *diabolica* Hauer, 1936b; *M. bulla constricta* f. *triangulata* Sudzuki, 1992.

Gosse 1851 p. 200 (*Monostyla bulla*); Stokes 1896 p. 23 plate 8 figs 11-13 (*Monostyla bipes*); Daday 1897 p. 136 text fig. (*Monostyla incisa*); Murray 1913a p. 353 plate 15 figs 33a-c; Harring & Myers 1926 p. 388-389 plate 37 figs 1, 2; p. 389-390 plate 37 figs 3, 4 (*Monostyla styrax*); p. 390-391 plate 37 figs 5, 6 (*Monostyla goniata*); Weisig 1928 p. 227 fig. 5 (*Monostyla bulla longistyla*); Edmondson 1935 p. 302 (*Lecane bulla*); Myers 1936a p. 4 (*M. bulla* var. *styrax*); Wulfert 1939 p. 608 figs 29a-d (*L. physalis*); Hauer 1936b p. 77-78 figs 1a-c (f. *diabolica*); Myers 1942 p. 263 ('*Lecane gonita*'); Bērziņš 1943 p. 236 figs 16-19 (*Monostyla ozolini*); Wiszniewski 1954 p. 63 (*L. bulla diabolica*, *L. bulla goniata*, *L. bulla styrax*); Voigt 1957 p. 232-233 plate 45 fig. 5; p. 237 plate 42 fig. 1 (*L. physalis*); Kutikova 1970 p. 468 fig. 659 (*L. (M.) styrax*); fig. 654 (*L. (M.) styrax longistyla*); p. 478 figs 679, 680 (*L. (M.) bulla diabolica*); p. 479 fig. 682 (*L. (M.) ozolini*); Koste 1978 p. 252-253 plate 83 figs 2-4, plate 85 figs 1a-c (incl. *L. bulla styrax*, *L. bulla goniata*); Naberezhniyi & Irmasheva 1975 (*L. bulla kutikovi*); Abdullaev 1989 p. 128 figs d, e (*L. bulla diana*); Koste & Shiel 1990 p. 4 plate 1 fig. 5 (*Monostyla bulla bulla*); p. 8 plate 3 fig. 1 (*M. goniata*); p. 13 plate 6 fig. 3 (*M. styrax*); Sudzuki 1992 p. 23-24 plate 7 figs 1-4, 9 (*M. bulla constricta* and f. *triangulata*); p. 24 plate 7 figs 5-8 (*M. bulla dentata*).

Differential diagnosis
L. bulla can, by its egg-shaped lorica, hardly be confused with any other species. Misidentifications as *L. lunaris* have occurred, in specimens with a dorso-ventrally compressed anterior part of the lorica. In most cases, the rounded antero-lateral edges of the lorica, but especially the details of the toe structure (relatively long claws, terminal part of toes with median fissure), permit a separation of the two taxa.

Description
Lorica stiff, rather flexible. Lorica egg-shaped, distinction between dorsal and ventral plates not always clear. Lorica smooth, occasionally folded or with pair of dorsal spines (f. *diabolica*: figs 363-364). Lateral sulci deep, or only in posterior region. Head aperture dorsally and, especially, ventrally strongly concave. Antero-lateral corners mostly rounded, occasionally angulate. Ventral plate elongate, transverse fold complete. Foot plate broad, rather flexible, with rounded coxal plates. Prepedal fold broad and short, with smoothly rounded posterior margin. Foot pseudosegment simple, not or distinctly projecting. Toe relatively long, parallel-sided, with distinct terminal fissure or with fused pseudoclaws. Pseudoclaws long, accessory claws mostly present. Terminal part of toes and claws occasionally fused.

Measurements: DPl. 100-146, DPw. 74-105, VPl. 93-167, VPw. 68-108, toe l. 43-93, claw l. 17-24.



Figs 358-365: L. bulla. 358-362, 365: ventral view, 363: dorsal view, 364: lateral view. 363-364: f. *diabolica*.
(358-359: after Segers *et al.*, 1992; 360, 361: Turkey (Segers *et al.*, 1992); 362: Rio Jatapú, Amazonas, Brazil; 363-364: after Hauer, 1936; 365: after Weisig, 1926 (sub. *Monostyla styrax longistyla*)).

Distribution
Cosmopolitan. One of the commonest, most eurytopic species of the genus.

Comments
The lorica of *L. bulla* is rather variable in the degree of stiffness and, consequently, shape. Small differences in lorica shape can not be considered taxonomically relevant. Taxa, based on such characters are here treated as synonyms. The identity of one subspecific taxon, ascertained by study of its holotype (*L. bulla diana* Abdullaev, in the Zoological Museum of Moscow University), supports this view. *L. physalis* Wulfert can neither be considered valid, as the character reported to differentiate the species from *L. bulla*, the length of the pseudoclaws (Koste, 1978), is subject to variation (e.g., fig. 365: *L. styrax longistyla*).

The variability in degree of fusion of the terminal part of the toe, and presence or absence of accessory claws, on the other hand, cannot be contributed to deformation by fixation. Based on this character, the following variants (of unresolved taxonomic rank) can be recognised.

– f. *goniata*: pseudoclaws separate, no accessory claws;
– f. *styrax*: pseudoclaws fused, no accessory claws.

103. *Lecane quadridentata* (Ehrenberg, 1832)
Figs 2, 15-16, 22, 32-33, 366-367, 513

Synonyms: *L. cornuta* (Schmarda, 1859) non (O.F. Müller)
L. bicornis (Daday, 1897)
L. sexidentata (Van Oye, 1926) Wiszniewski, 1954
L. quadridentata arthrodactyla Bērziņš, 1982a

Infrasubspecific taxon: f. *gigantea* Koste, 1988

Ehrenberg 1832 p. 130 (*Monostyla quadridentata*); Schmarda 1859 p. 58 plate 14 fig. 122 (*Lepadella cornuta*); Daday 1897 p. 139 text fig. (*M. bicornis*); Murray 1913a p. 354 plate 15 fig. 34; Harring & Myers 1926 p. 391-392 plate 38 figs 3-5; Van Oye 1926 p. 49-50 fig. 2 (*Monostyla sexidentata*); Edmondson 1935 p. 302 (*Lecane quadridentata*); Wiszniewski 1954 p. 70; Kutikova 1970 p. 472 fig. 666; Koste 1978 p. 255 plate 83 figs 8a-c; Bērziņš 1982a p. 10 fig. 16 (*L. quadridentata arthrodactyla*); De Ridder 1987 p. 77; Koste 1988a p. 120-121 figs 24a-b (incl. f. *gigantea*); Koste & Shiel 1990 p. 9-10 plate 4 fig. 5 (*Monostyla quadridentata*); Segers 1992 p. 359.

Differential diagnosis
L. quadridentata is easily distinguished by the presence of a pair of curved, elongate projections medially on the dorsal head aperture margin.

Description
Lorica stiff, smooth. Dorsal plate narrower than ventral plate, lateral margins reach anterior end of lorica. Head aperture margin dorsally variable, with a pair of con-

spicuous outward curved antero-median projections, ventrally variably concave. Antero-lateral corners angulate or projecting. Ventral plate longer than wide to elongate, widest in the distal third, transverse fold complete. Lateral margins smooth, curved. Lateral sulci deep. Foot plate relatively narrow, coxal plates rounded, simple. Prepedal fold broad, with rounded distal margin. Foot pseudosegment projecting. Toe single, nearly parallel-sided, bearing fused pseudoclaws and accessory claws. Male: Figure 513 (see Harring & Myers, 1926).

Measurements: DPl. (incl. projections) 104-196, DPw. 79-130, VPl. 110-194, VPw. 81-133, toe l. 45-93, claw l. 14-26. Length of antero-median projections 18-51.

Distribution
The species is eurytopic and cosmopolitan. It is relatively common.

Comments
The f. *gigantea* Koste, 1988 has, although being especially large, no taxonomic relevance and does not merit being named separately.

104. *Lecane psammophila* (Wiszniewski, 1932)
Figs 368-369, 514

Synonym: *L. fadeevi* (Neiswestnova-Shadina, 1935) Voigt, 1957

Wiszniewski 1932b p. 97 plate 4 figs 18-20 (*Monostyla psammophila*); Wiszniewski 1934a p. 151-152 plate 6 fig. 12; Wiszniewski 1934b p. 384 plate 63 figs 78, 79; Neiswestnova-Shadina 1935 p. 561 fig. 7 (*Monostyla fadeevi*); Myers 1942 p. 264 (*Lecane psammophila*); Voigt 1957 p. 238 (*Lecane fadeewi*); Kutikova 1970 p. 469 fig. 652; Koste 1978 p. 245 plate 81 fig. 13a-e (partim); Bancsi 1988 p. 381 figs 440a-b.

Type locality
Lake Wigry, Poland.

Differential diagnosis
L. psammophila resembles *L. obtusa*, but is easily distinguished by its relatively thick toe bearing short claws.

Description
Lorica stiff. Dorsal plate wider than ventral plate, smooth or with irregular folds. Head aperture margins coincident, straight or slightly concave, antero-lateral corners angulate. Ventral plate slightly longer than wide, smooth, transverse fold complete. Lateral margins smooth, slightly curved. No pronounced lateral sulci. Foot plate broad, rounded posteriorly, coxal plates rounded. Prepedal fold narrow, elongate, distal margin with median projection. Foot pseudosegment simple, not projecting. Toe single, relatively thick, with local constrictions. Two relatively short claws present. Male: Figure 514 (see Wiszniewski, 1934a).

Measurements: DPl. 65-68, DPw. 65-70, VPl. 65-68, VPw. 50-64, toe l. 25-28, claw l. 4.

Distribution
Europe, North America. *L. psammophila* is a psammobiont.

Note
Lecane mitella (Myers, 1936a)(Figure 370), described from the hygropsammon of Lenape and Union Lakes, Great Harbor River at Weymouth, and Pleasant Mills (New Jersey, U.S.A.), differs from *L. psammophila* by having small antero-lateral spines on the lorica, and a parallel-sided toe. It has not been reported since its description.

Measurements: DPl. 76, DPw. 65, VPl. 80, VPw. 55, toe l. 35.

105. *Lecane galeata* (Bryce, 1892)
Figs 371-372

Synonyms: *L. parva* (Daday, 1897)
L. pygmaea (Daday, 1897) Myers, 1937
L. turbo (Murray, 1913c)
L. beningi Tarnogradski, 1961b (n. syn.)

Bryce 1892 p. 275, text fig. (*Monostyla galeata*); Daday 1897 p. 132 (*Monostyla parva*); p. 139 fig. 7 (*Monostyla pygmaea*); Murray 1913c p. 558 plate 22 figs 11a-e (*Monostyla turbo*); Harring & Myers 1926 p. 401-402 plate 42 figs 1, 2 (*M. pygmaea*); Myers 1937 p. 4; Wulfert 1940 p. 577 figs 24a-c; Myers 1942 p. 263 (*Lecane galeata*); Tarnogradski 1961b p. 51 figs 50-52 (*Lecane (M.) beningi*); De Ridder 1969 p. 170-171 fig. 18; Kutikova 1970 p. 472 fig. 665 (*L. beningi*); Koste 1978 p. 244 plate 81 figs 4a, b.

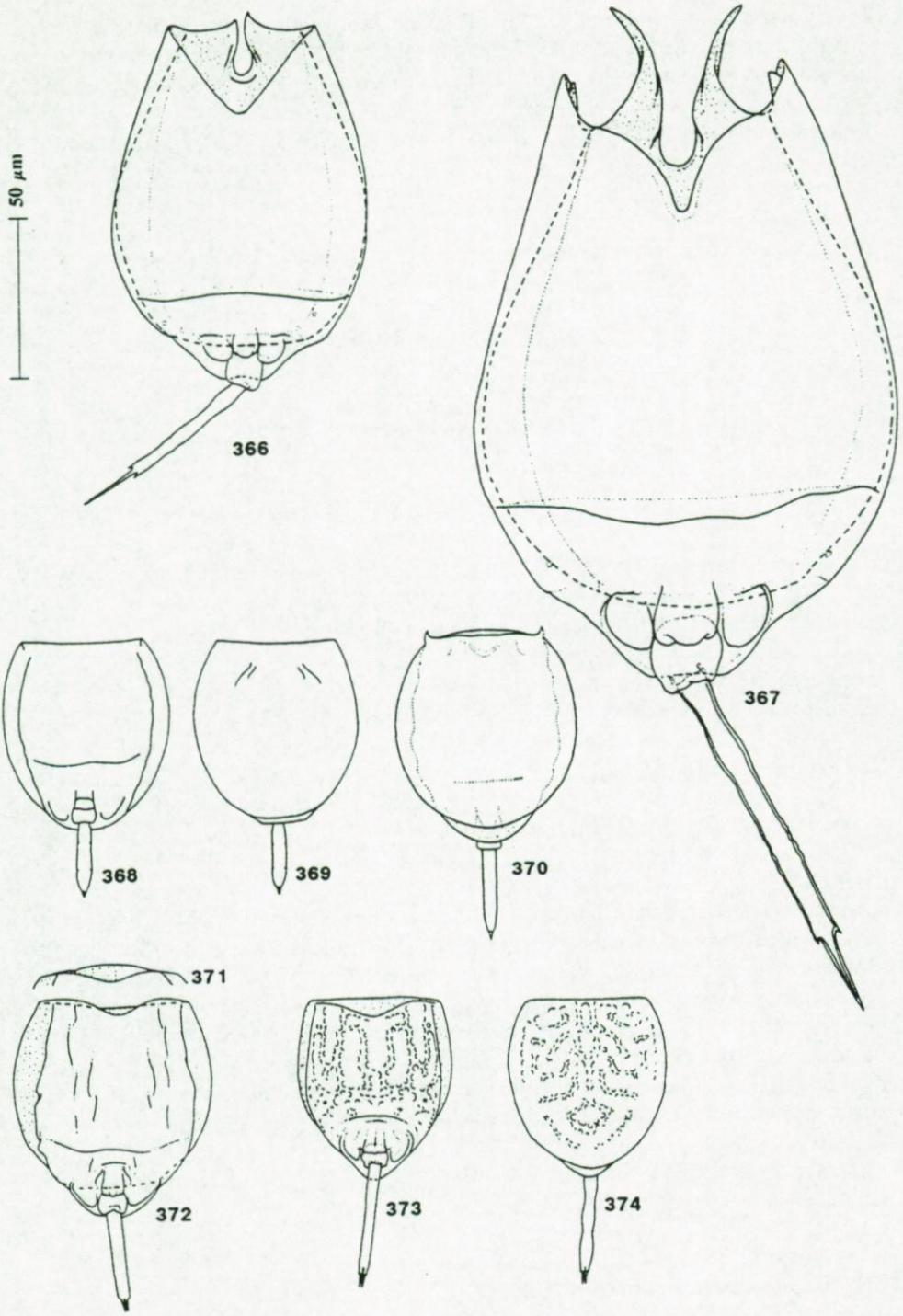
Type locality
Sandown, U.K.

Differential diagnosis
By its lorica having a consistently wider dorsal than ventral plate and a biconvex ventral anterior margin, this species cannot be confused with any congener but *L. myersi*. It differs from the latter by its a relatively short toe, and smooth lorica.

Description
Loricate *Lecane*. Dorsal plate wider than ventral plate, smooth or with some irregular folds. Head aperture margins nearly parallel, ventrally biconvex, dorsally straight or slightly convex. Antero-lateral corners rounded. Ventral plate slightly longer than wide, not or weakly ornamented. Transverse fold complete. Lateral margins smooth,

→

Figs 366-367: L. quadridentata, ventral view.
Figs 368-369: L. psammophila. 368: ventral view, 369: dorsal view.
Fig. 370: L. mitella, dorsal view.
Figs 371-372: L. galeata, ventral view. 371: head aperture.
Figs 373-374: L. myersi. 373: ventral view, 374: dorsal view.
(366-367: after Segers *et al.*, 1992; 368-369: after Wiszniewski, 1932b; 370: after Myers, 1936a; 371-372: 'Ronde Put', Postel, Belgium; 373-374: pond near Lobo Reservoir, São Paulo, Brazil).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nearly parallel. No pronounced lateral sulci. Foot plate broad, rounded posteriorly, coxal plates rounded triangular. Prepedal fold broad, elongate. Foot pseudosegment simple, not projecting. Toe single, parallel-sided, bearing two short, completely separated claws.

Measurements: DPl. 55-80, DPw. 45-72, VPl. 52-88, VPw. 50-65, toe l. 34-37, claw l. 4-6.

Distribution
Cosmopolitan but uncommon, between submerged mosses in acid waters.

Comments
L. beningi Tarnogradski concerns an incompletely contracted *L. galeata*.

106. *Lecane myersi* Segers, 1993
Figs 373-374

Synonym: *L. ornata* (Harring & Myers, 1926) Voigt, 1957 non (Daday, 1897)

Harring & Myers 1926 p. 402-403 plate 36 figs 1, 2 (*Monostyla ornata*); Voigt 1957 p. 238 (*Lecane ornata*); Wang 1961 p. 143-144 figs 126a, b (*Monostyla ornata*); Koste 1978 p. 251 plate 82 figs 5a, b; Segers 1993 p. 52.

Type locality and type
Hyattsville, near Washington, D.C., U.S.A. Paratype in PANS.

Differential diagnosis
The species resembles *L. galeata* in general shape, but has a relatively longer toe and a characteristically ornamented lorica.

Description
Loricate *Lecane*. Dorsal plate wider than ventral plate, with clear pattern of ornaments. Head aperture margins nearly parallel, ventrally biconvex, dorsally straight or slightly convex. Antero-lateral corners rounded. Ventral plate slightly longer than wide, strongly ornamented, transverse fold incomplete. Lateral margins smooth, nearly parallel. No pronounced lateral sulci. Foot plate broad, rounded triangular posteriorly. Coxal plates rounded triangular. Prepedal fold broad, elongate, with median projection. Foot pseudosegment simple, not projecting. Toe single, parallel-sided, occasionally with local constrictions. Two short, completely separated claws present.

Measurements: DPl. 65-82, DPw. 60-68, VPl. 77-87, VPw. 58-60, toe l. 38-42, claw l. 5-7.

Distribution
Recorded from North and South America, Africa and China. The species lives between submerged plants in acid waters. It is probably a warm-stenotherm.

107. *Lecane obtusa* (Murray, 1913a)
Figs 375-377

Synonyms: *L. lunaris* f. *aperta* (Steinecke, 1916) Voigt, 1957
L. vastita (Harring & Myers, 1926) Wiszniewski, 1954

Murray 1913a p. 357 plate 15 figs 37a, b (*Monostyla obtusa*); Steinecke 1916 p. 89-90 figs 2c, d (*Monostyla lunaris* f. *aperta*); Harring & Myers 1926 p. 403-404 plate 42 figs 5, 6; p. 404 plate 42 figs 3, 4 (*M. vastita*); Hauer 1938 p. 542-543 figs 65a, b; Myers 1942 p. 264 (*Lecane obtusa*); Wiszniewski 1954 p. 72; Voigt 1957 p. 235 plate 43 figs 4, 7d; plate 43 fig. 4 (*L. lunaris* f. *aperta*); Kutikova 1970 p. 472-473 fig. 668; p. 473; Koste 1978 p. 243-244 plate 81 fig. 2a, b, 3a, b (incl. f. *vastita*); Koste & Shiel 1990 p. 9 plate 4 fig. 3 (*Monostyla obtusa*).

Type locality
Pond at Gloria, Rio de Janeiro, Brazil.

Differential diagnosis
L. obtusa can be confused with *L. galeata*. The species is distinguished by its nearly straight, parallel head aperture margins.

Description
Loricate *Lecane*. Dorsal plate wider than ventral, smooth or weakly ornamented. Head aperture margins coincident, straight or slightly convex. Antero-lateral corners rounded, angulate or with minute spicule. Ventral plate slightly longer than wide, with incomplete transverse and longitudinal folds, not or weakly ornamented. Lateral margins smooth, nearly parallel-sided. No pronounced lateral sulci. Foot plate broad, rounded posteriorly, coxal plates rounded. Prepedal fold narrow, elongate, distally with median projection. Foot pseudosegment simple, not or scarcely projecting. Toe single, parallel-sided, bearing two completely separated claws.

Measurements: DPl. 53-78, DPw. 45-78, VPl. 62-90, VPw. 45-62, toe l. 22-35, claw l. 6-13.

Distribution
Cosmopolitan, more frequent in tropical and subtropical regions.

Note
L. whitfordi (Ahlstrom, 1938)(Figs 378-379), only known from Lake Waccamaw, North Carolina, U.S.A. (and Argentina?: *L. obtusa* after José de Paggi, 1989), resembles *L. obtusa* in all aspects but the presence of large, triangular antero-lateral projections. Minute antero-lateral spicules have been recorded in *L. obtusa* (Hauer, 1938: see figs 376-377), but this observation does not offer sufficient evidence to consider the taxa synspecific.

Measurements (by José de Paggi between brackets): DPl. 76 (80), DPw. 69(75), VPl. 88(90), VPw. 59, toe l. 36(35), claw l. 8(5).

108. *Lecane subulata* (Harring & Myers, 1926)
Figs 380-382

Synonym: *L. rylovi* Tarnogradski, 1961a (n. syn.)

L. gwileti after Wulfert (1960).
L. perpusilla after Koste (1962), *L. subulata* f. *perpusilla* after Koste (1978).

Harring & Myers 1926 p. 410-411 plate 45 figs 3, 4 (*Monostyla subulata*); Hauer 1929 p. 155 figs 12a-b; Myers 1937 p. 4 (*Lecane subulata*); Tarnogradski, 1961a p. 24 figs 60-64 (*L. rylovi*); Tarnogradski 1961b p. 59-60 figs 68-71 (*L. rylovi*); Kutikova 1970 p. 469 fig. 657 (*L. rylovi*); fig. 658; Koste 1978 p. 243 plate 81 fig. 1a, b.

Type locality
Not designated (Fairly common in U.S.A., Epping Forest, U.K.).

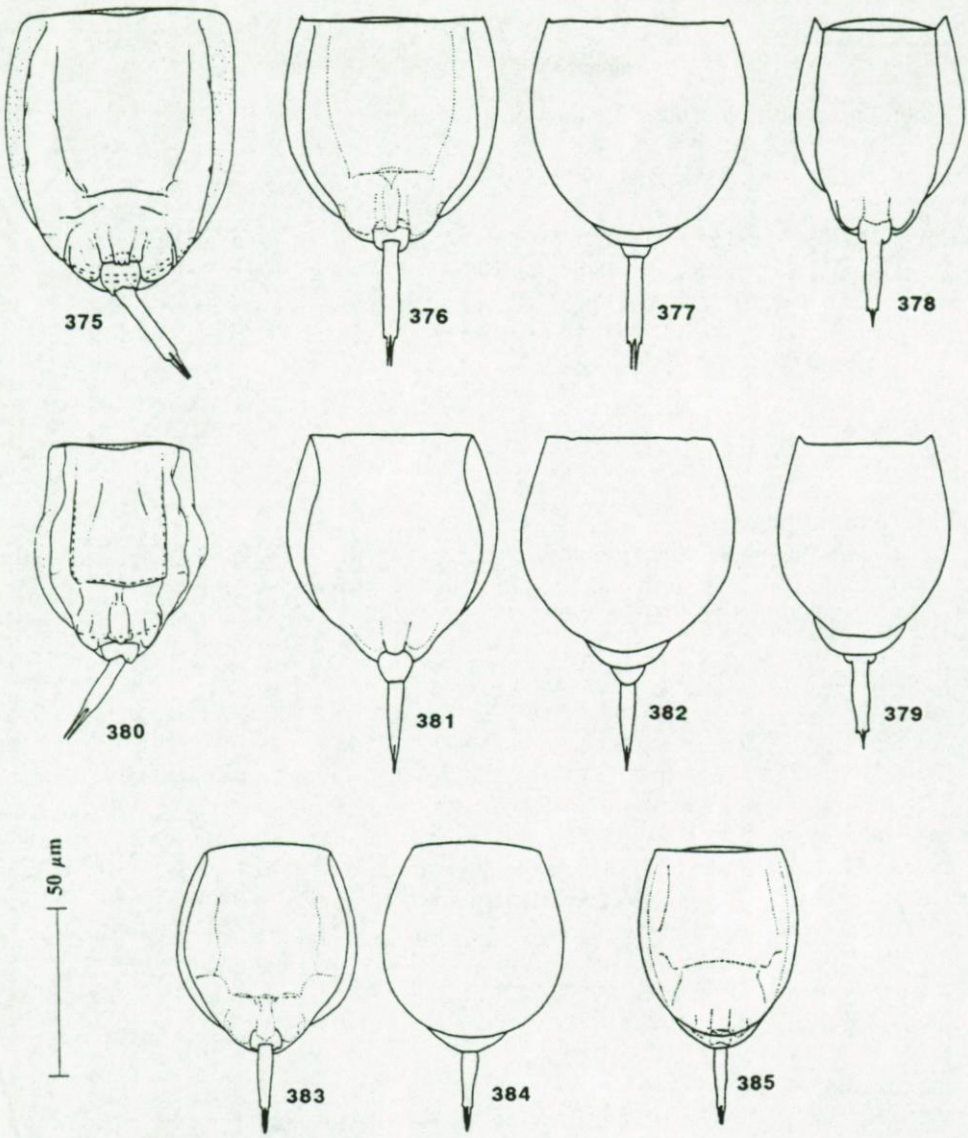
Differential diagnosis
L. subulata resembles *L. galeata*, *L. obtusa* and *L. perpusilla*. The species is characterised by its relatively soft lorica and its incompletely separated, relatively long claws. *L. subulata* is closest to *L. perpusilla*. The two species are reported to differ mainly by their size (*L. subulata* being larger than *L. perpusilla*), and by their different toe.

Description
Lorica relatively soft, easily deformed. Dorsal plate wider than ventral plate, smooth or with irregular folds. Head aperture margins coincident, straight or slightly convex, antero-lateral corners angulate. Ventral plate slightly longer than wide, with an incomplete transverse and longitudinal folds, smooth. Lateral margins smooth or irregularly undulate, nearly parallel-sided, with notches in anterior region. No pronounced sulci laterally. Foot plate broad, rounded posteriorly. Coxal plates rounded. Prepedal fold narrow, elongate, distally with median projection. Foot pseudosegment simple, not or distinctly projecting. Toe single, mostly parallel-sided, bearing two long, incompletely separated claws.

Measurements: DPl. 60-64, DPw. 59-65, VPl. 65-68, VPw. 50-52, anterior edge w. 44-50, toe l. 16, claw l. 10.

Distribution
Not uncommon between submerged mosses in acid waters. Holarctic?.

Comments
L. rylovi Tarnogradski concerns an incompletely contracted *L. subulata*.



Figs 375-377: L. obtusa. 375-376: ventral view, 377: dorsal view.
Figs 378-379: L. whitfordi. 378: ventral view, 379: dorsal view.
Figs 380-382: L. subulata. 380, 381: ventral view, 382: dorsal view.
Figs 383-385: L. perpusilla. 383: ventral view, 384, 385: dorsal view.
(375: Madagascar (Segers, 1992); 376-377: after Hauer, 1938; 378-379: after Ahlstrom, 1938; 380: 'Ronde Put', Postel, Belgium; 381-382: after Harring & Myers, 1926; 383-384: after Hauer, 1929; 385: after Myers, 1942 (sub. *L. brevita*)).

109. *Lecane perpusilla* (Hauer, 1929)
Figs 383-385, 515-516

Synonym: *L. brevita* Myers, 1942 (n. syn.)

non *L. perpusilla* after Koste (1962)

Hauer 1929 p. 156-157 figs 14a, b (*Monostyla perpusilla*); Tarnogradski 1930 p. 128 plate 5 fig. 8; Wiszniewski 1936 p. 184-185 fig. 5; Myers 1942 p. 280 plate 25 fig. 12 (*L. brevita*); Wiszniewski 1953 p. 378 (*Lecane perpusilla*); Kutikova 1970 p. 480 fig. 683; Koste 1978 p. 243 (*L. subulata* f. *perpusilla*); Koste & Shiel 1990 p. 13 plate 6 fig. 5 (*Monostyla subulata perpusilla*).

Type locality
Near Freiburg, F.R.G.

Differential diagnosis
L. perpusilla belongs to the group of *L. obtusa* by its dorsal plate being wider than the ventral anteriorly. It is similar to *L. subulata*, and differs from the latter by its relatively smaller size and different toe.

Description
Lorica relatively soft, easily deformed. Dorsal plate wider than ventral plate, smooth or with irregular folds. Head aperture margins coincident, straight or slightly convex, antero-lateral corners angulate. Ventral plate slightly longer than wide, with an incomplete transverse and longitudinal folds, smooth. Lateral margins smooth, curved, with anterior notches. No pronounced lateral sulci. Foot plate broad, rounded posteriorly, coxal plates rounded. Prepedal fold narrow, elongate, distally with median projection. Foot pseudosegment simple, not projecting. Toe broadest in the basal third, bearing two completely separated, relatively long claws. Male: Figs 515-516 (see Wiszniewski, 1936).

Measurements: DPl. 38-60, DPw. 42-56, VPl. 41-66, VPw. 34-48, toe l. 13-24, claw l. 5.5-8.

Distribution
Africa, Europe, Caucasus mountains, North America. A single unconfirmed record from Australia. The species lives between submerged mosses. As the single African record is from Mount Kilimanjaro (De Smet & Bafort, 1990b) and as all other records are from temperate regions, the species may be a cold-stenotherm.

110. *Lecane spinulifera* Edmondson, 1935
Figs 386-388

Synonyms: *L. spinifera* (Edmondson, 1934) non (Idelson, 1924)
L. aliger Nogrady, 1983

Edmondson 1934 p. 469 figs 3a-b (*Monostyla spinifera* non Idelson 1924);

Edmondson 1935 p. 304; Nogrady 1983 p. 109-111 figs 4a-c (*L. (M.) aliger*); Turner 1990 p. 145 figs 4a-c.

Type locality
Lago Limon, Hispaniola, Haiti.

Differential diagnosis
L. spinulifera can be confused with *L. punctata* or *L. margarethae*, but is characterised by the shape of its head aperture and by its projecting, sickle-shaped coxal plates.

Description
Lorica stiff. Dorsal plate anteriorly narrower, medially wider than or as wide as ventral plate, smooth or slightly punctate. Head aperture margin dorsally convex, ventrally concave, with a pair of pointed projections laterally, antero-lateral corners angulate. Ventral plate longer than wide, lateral margins smooth, slightly curved, straight or irregularly undulate. Lateral sulci deep. Foot plate broad, rounded posteriorly. Coxal plates sickle-shaped, projecting. Prepedal fold narrow, elongate, distal margin with median projection. Foot pseudosegment simple, projecting. Toe single, parallel-sided, bearing two claws.

Measurements: DPl. 76-92, DPw. 48-67, VPl. 82-98, VPw. 48-75, toe l. 30-40, claw l. 7.

Distribution
The species has been recorded from the U.S.A., Haiti, Grand Bahamas and Brazil.

111. *Lecane acanthinula* (Hauer, 1938)
Figure 389

non cf. *L. acanthinula* after Koste (1972)

Hauer 1938 p. 535-536 figs 60a, b (*Monostyla acanthinula*); Wiszniewski 1954 p. 66 (*L. inopinata acanthinula*); Segers & Dumont 1993b p. 15-17 figs 7a-c; Segers *et al.* 1994 p. 252 fig. 1.

Type locality
Ranu Lamongan, Ranu Pakis, Java.

Differential diagnosis
L. acanthinula is close to *L. furcata*. It is diagnosed by the presence of small antero-lateral spines. It differs from *L. copeis* by its ventral plate having an incomplete transverse fold and longitudinal folds, its different prepedal fold and parallel-sided toe.

Description
Lorica stiff. Dorsal plate anteriorly narrower, medially wider than ventral, smooth. Head aperture margins coincident, straight, with small antero-lateral spines. Ventral plate slightly longer than wide, with incomplete transverse and longitudinal folds,

smooth. Lateral margins with anterior notches, parallel. Lateral sulci deep. Foot plate broad, rounded posteriorly, coxal plates rounded. Prepedal fold elongate, narrow, posteriorly with median projection. Foot pseudosegment simple, not or slightly projecting. Single parallel-sided toe, two completely separated claws.

Measurements: Tot. l. 87, DPl. 62-70, DPw. 56-64, VPl. 66-68, VPw. 48-54, toe l. 18-20, claw l. 5-7.

Distribution
Java, Oman, India. Single illustrated record from South America (Koste, 1972) concerns a misidentified *L. copeis*. A rare species, living in fresh and slightly saline waters.

Comments
A synonymy of this species with *L. obtusa*, as proposed by Koste (1972), in the combination *L. obtusa* f. *acanthinula*, is erroneous.

112. *Lecane margarethae* Segers, 1991
Figs 401-403

Synonym: *L. deridderae* José de Paggi, 1989 non Koste, 1972

L. punctata after Ahlstrom (1934), De Ridder (1977)

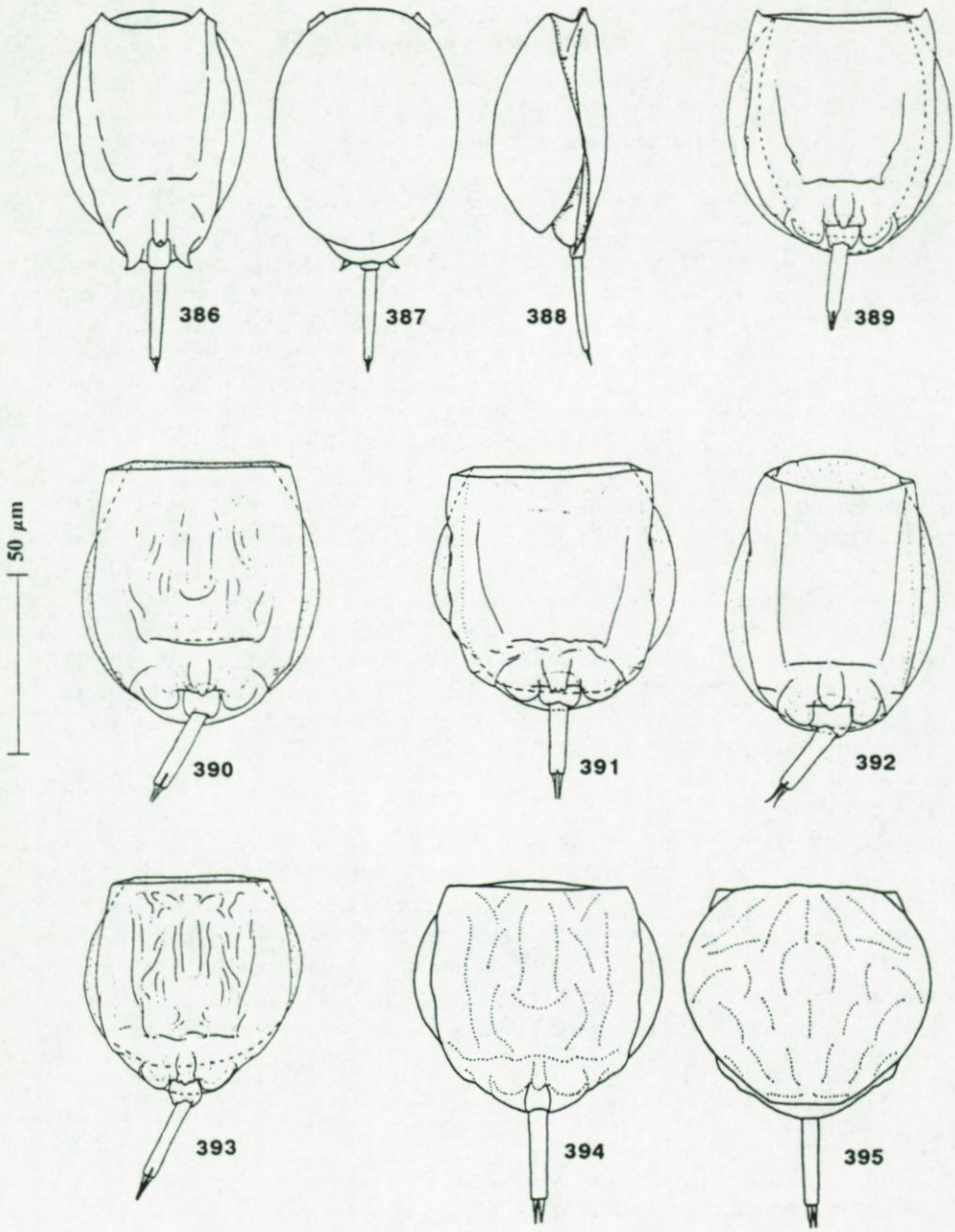
José de Paggi 1989 p. 234-235 fig. 6 (*L. deridderae*); Segers 1991a p. 77.

Differential diagnosis
L. margarethae differs from *L. punctata* by having distinct antero-lateral spines on its lorica, by its head aperture margins being slightly (dorsally) or more pronouncedly (ventrally) concave (dorsally straight or convex, ventrally broadly sinuate in *L. punctata*), by its lorica being relatively more elongate, and by being larger than *L. punctata*. It differs from *L. spinulifera* by having a not or scarcely projecting foot pseudosegment, rounded coxal plates and a generally different lorica shape.

Description
Lorica stiff. Dorsal plate anteriorly narrower, medially wider than ventral plate, smooth or slightly punctate. Head aperture margin dorsally with median sinus, ventrally broadly V-shaped, with antero-lateral spines. Ventral plate longer than wide, lateral margins smooth, slightly curved. Lateral sulci deep. Foot plate broad, rounded posteriorly, coxal plates rounded. Prepedal fold narrow, elongate, distally with median projection. Foot pseudosegment simple, not or slightly projecting. Toe single, bearing two claws.

Measurements: DPl. 110-113, DPw. 89-103, VPl. 107-118, VPw. 70-77, toe l. 32-35, claw l. 6.5.

Distribution
Known from Florida and the Caribbean island Bonaire.



Figs 386-388: L. spinulifera. 386: ventral view, 387: dorsal view, 388: lateral view.
Fig. 389: L. acanthinula, ventral view.
Figs 390-392: L. furcata, ventral view (see also fig. 333).
Figs 393-395: L. rugosa. 393, 394: ventral view, 395: dorsal view.
(386-388: after Turner, 1990; 389: Oman (Segers & Dumont, 1993b); 390: Nigeria (Segers *et al.*, 1993a); 391-392: after Segers *et al.*, 1992; 393: pond near Lobo Reservoir, São Paulo, Brazil; 394-395: after Harring & Myers, 1926).

113. *Lecane punctata* (Murray, 1913a)
Figs 404-407

Synonyms: *L. harringi* (Ahlstrom, 1934) Wiszniewski, 1954
L. aguessei De Ridder, 1960 (n. syn.)

non *L. punctata* after Ahlstrom (1934), De Ridder (1977).

Murray 1913a p. 355-357 plate 15 figs 36a-d (*Monostyla punctata*); Harring & Myers 1926 p. 407-408 plate 44 figs 3, 4; Ahlstrom 1934 p. 263 (*M. harringi*); Wiszniewski 1954 p. 65, 69 (*Lecane punctata*); Hauer 1956 p. 301 figs 16a-b (*L. harringi*); De Ridder 1960 p. 168-172 figs 2a, b (*L. aguessei*); Tarnogradski 1961b p. 57 fig. 62-63; Kutikova 1970 p. 476 fig. 673; De Ridder 1977 p. 115-116 fig. 34 (*L. harringi*); Koste 1978 p. 246 plate 80 figs 4a-d, plate 81 figs 9a, b; José de Paggi 1989 p. 232-234 fig. 16; Turner 1990 p. 145-149 fig. 5 (partim).

Type locality
Salt-water lagoon near the Botanical Gardens, Rio de Janeiro, Brazil.

Differential diagnosis
L. punctata differs from *L. furcata* by its head aperture margin being slightly convex dorsally and broadly sinuate ventrally (coincident or parallel, nearly straight in *L. furcata*). *L. margarethae* has a different head aperture shape, its lorica is more elongate, and the species is larger than *L. punctata*. *L. spinulifera* has projecting coxal plates and foot pseudosegment.

Description
Lorica stiff. Dorsal plate anteriorly narrower, medially wider than ventral plate, smooth or weakly punctate. Head aperture margin dorsally convex, ventrally broadly sinuate with shallow median sinus, antero-lateral corners angulate. Ventral plate longer than wide. Lateral margins smooth or irregularly folded, with anterior notches. Lateral sulci deep. Foot plate broad, rounded posteriorly, coxal plates rounded. Prepedal fold narrow, elongate, distally with median projection. Foot pseudosegment simple, not or slightly projecting. Toe single, bearing two claws.

Measurements: DPl. 58-95, DPw. 60-73, VPl. 59-84, VPw. 48-65, toe l. 18-27, claw l. 5-7.

Distribution
L. punctata occurs in slightly saline or fresh water. The species is a warm-stenotherm, with a cosmo(sub)tropical distribution.

Comments
The identity of specimens with triangular sublateral projections on the ventral head aperture margin lorica (Figs 406-407; Hauer, 1956; Turner, 1990), remains unresolved. They are tentatively treated as variants without special taxonomic significance.

114. *Lecane furcata* (Murray, 1913a)
Figure 8, 333, 390-392

Synonyms: *L. ovalis* (Jakubski, 1914)
L. tethis (Harring & Myers, 1926) Wiszniewski, 1954
L. elachis (Harring & Myers, 1926) Myers, 1942
L. mologensis (Bogoslovsky, 1935) Kutikova, 1970 (n. syn.)
L. vanoyei De Ridder, 1960 (n. syn.)

Monostyla sp. (*rugosa*?) after Hauer (1938)
L. (M.) scutata after Koste (1972, 1978 partim).
L. rugosa after Koste (1972)

Murray 1913a p. 358-359 plate 15 figs 40a, b (*Monostyla furcata*); Jakubski 1914 p. 35 (*Monostyla ovalis*); Harring & Myers 1926 p. 405 plate 38 figs 1, 2 (*Monostyla tethis*); p. 406 plate 43 figs 1, 2 (*Monostyla elachis*); p. 407 plate 43 figs 5, 6; Hauer 1929 p. 154 figs 11a, b; Bogoslovski 1935 p. 110 figs 6, 7 (*Monostyla mologensis*); Edmondson 1936 p. 215 (*Lecane furcata*); Hauer 1938 p. 539-540 figs 62a, b (*M. elachis*); p. 540 figs 63a, b; Carlin-Nilsson 1939 p. 29 figs 8c-d; Myers 1942 p. 263; Wiszniewski 1954 p. 65 (*L. furcata elachis*); De Ridder 1960 p. 173-174 figs 4a, b (*L. vanoyei*); Pejler 1962 p. 370 fig. 107; Kutikova 1970 p. 468 fig. 655 (*L. mologensis*); p. 471 fig. 662 (*L. tethis*); fig. 663 (*L. elachis*); p. 480-481 fig. 685; Koste 1978 p. 242-243 plate 80 figs 2a, b; 2c, d (var. *elachis*); plate 81 figs 7a, b (var. *thetis*); Koste & Shiel 1990 p. 7-8 plate 2 fig. 5 (*Monostyla elachis*); p. 8 plate 2 fig. 6 (*Monostyla furcata*); p. 13 plate 6 fig. 6 (*Monostyla tethis*); Segers *et al.* 1992 p. 188 figs 2a, b.

Type locality
Rio de Janeiro, Brazil.

Differential diagnosis
L. furcata differs from *L. acanthinula* by its angulate antero-lateral corners; from *L. rugosa* by its relatively longer lorica, shorter toe and larger foot plate; from *L. scutata* by its ventral plate with incomplete transverse and longitudinal folds and different toe shape. The species is also closely related to *L. braziliensis*, *L. inopinata*, *L. sympoda* and *L. undulata*, all of these have incompletely fused toes.

Description
Lorica stiff. Dorsal plate anteriorly narrower, medially wider than ventral plate, smooth or ornamented. Head aperture margins nearly coincident or parallel, straight or slightly convex, antero-lateral corners angulate. Ventral plate slightly longer than wide, with incomplete transverse and longitudinal folds, occasionally ornamented. Lateral margins smooth, nearly parallel, occasionally with anterior notches. Lateral sulci deep. Foot plate broad, rounded posteriorly, coxal plates rounded. Prepedal fold narrow, elongate, distally with median projection. Foot pseudosegment simple, not or slightly projecting. Toe single, with terminal fissure of varying length, up to 1/5th of toe length. Claws variable: diverging, parallel-sided or fused(?).

Measurements: DPl. 54-72, DPw. 57-70, VPl. 48-76, VPw. 54-62, toe l. 21-35, claw l. 4-7.

Distribution
One of the commonest Lecanidae from between submerged vegetation. Cosmopolitan.

Comments
The intensity of the ornamental folds on ventral and/or dorsal plate varies strongly, not only in *L. furcata* but also in related species such as *L. inopinata*. Taxa, diagnosed by this character (*L. tethis*, *L. elachis*) should therefore be treated as synonyms. As the lorica shape depends on the degree of contraction of the animals (compare figure 391 and 392), *L. mologensis* (Bogoslovsky), which is an 'expanded' rather than contracted, ornamented *L. furcata*, is also listed as a synonym.

115. *Lecane rugosa* (Harring, 1914)
Figs 393-395

non *L. rugosa* after Koste (1972), Koste (1974)

Harring 1914 p. 548-549 plate 24 figs 4-6 (*Monostyla rugosa*); Harring & Myers 1926 p. 405-406 plate 43 figs 3-4; Wiszniewski 1954 p. 62 (*Lecane rugosa*); Kutikova 1970 p. 481 fig. 686; Koste 1978 p. 242 plate 80 figs 3a-d (*L. furcata* var. *rugosa*, partim); Koste & Shiel 1990 p. 11 figs 5a-b (*Monostyla rugosa*).

Type locality
Rio Grande Reservoir; near Gatun; Rio Grande; Rio Trinidad: Panama.

Differential diagnosis
L. rugosa can be confused with an ornamented *L. furcata*. The species can be distinguished from the latter by its lorica, which is nearly as wide as long, by its relatively narrower foot plate and its relatively longer toe.

Description
Loricate *Lecane*. Dorsal plate anteriorly narrower, medially wider than ventral plate, ornamented. Head aperture margins nearly coincident or parallel, nearly straight, mostly irregular through contraction. Antero-lateral corners angulate. Ventral plate nearly as wide as long, with incomplete transverse and longitudinal folds, ornamented. Lateral margins mostly irregularly undulate, slightly curved. Lateral sulci shallow or nearly absent. Foot plate small, relatively narrow, rounded posteriorly. Coxal plates rounded. Prepedal fold narrow, elongate, distally with median projection. Foot pseudosegment simple, not or slightly projecting. Toe relatively long, parallel-sided, with short terminal fissure. Claws completely separated.

Measurements: DPl. 53-54, DPw. 61-62, VPl. 57-59, VPw. 49-54, toe l. 21-29, claw l. 6-8.

Distribution
Insufficiently known. *L. rugosa* may have been overlooked or confused with other species such as *L. furcata*.

116. *Lecane gwileti* (Tarnogradski, 1930)
Figure 400

Synonym: *L. kieferi* (Hauer, 1931)

Tarnogradski 1930 p. 129 fig. 13 (*Monostyla gwileti*); Hauer 1931 p. 11-12 fig. 5a, b (*Monostyla kieferi*); Hauer 1935a p. 263; Wiszniewski 1954 p. 60 (*Lecane gwileti*); Voigt 1957 p. 229 plate 43 fig. 3; Tarnogradski 1961b p. 55 figs 60, 62 (*L. gwilety*); Kutikova 1970 p. 469-471 fig. 660 (*L. gwilety*); Koste 1978 p. 244-245 plate 81 figs 11a-b, 5a, b.

Differential diagnosis
L. gwileti resembles *L. furcata*, but the shape of the terminal part of the toe is distinctive: the claws are hardly separated from the toe, whereas in *L. furcata* the claws are distinctly separated. The species resembles *L. asymmetrica*, but has a parallel-sided toe.

Description
Loricate *Lecane*. Dorsal plate anteriorly narrower, medially wider than ventral plate, smooth. Head aperture margins nearly coincident, straight or slightly convex, with angulate antero-lateral corners. Ventral plate slightly longer than wide, with incomplete transverse and longitudinal folds. Lateral margins straight, nearly parallel. Lateral sulci deep. Foot plate broad, rounded posteriorly, coxal plates rounded triangular. Prepedal fold narrow, elongate, with median projection distally. Foot pseudosegment simple, relatively broad, not projecting. Toe single, with terminal fissure or with incompletely separated pseudoclaws.

Measurements: DPl. 60-67, DPw. 52-57, VPl. 63-70, VPw. 46-52, ant. edge width 40-44, toe l. 20-21, claw l. 4-6.

Distribution
Rare. Recorded from Europe (Belgium, Germany, Poland) and Ossetia (Caucasus).

117. *Lecane asymmetrica* (Murray, 1913a)
Figs 396-399

Synonym: *L. janetzkyi* Koste *et al.*, 1991 (n. syn.)

Murray 1913a p. 361-362, plate 15 figs 44a, b (*Monostyla asymmetrica*); Voigt 1957 p. 238 (*Lecane asymmetrica*); Koste, Janetzky & Vareschi 1991 p. 154-155 figs 8a-d (*L. (M.) janetzkyi*).

Type locality
Guyana.

Differential diagnosis
The species is close to *L. furcata* and, especially, *L. gwileti*. It is unmistakable by the

shape of its toe being broadest basely, smoothly narrowing towards the middle and ending in two inconspicuously separated claws ('forked at the end': Murray (1913a); '... kurzen Krallen ... durch eine stumpfe Kerbe voneinander getrennt und von außen nicht abgesetzt': Koste *et al.* (1991)).

Description
Lorica stiff. Dorsal plate smooth, anteriorly narrower, medially wider than ventral plate. Lateral sulci shallow. Head aperture margins nearly coincident, straight. Antero-lateral corners angulate. Ventral plate with longitudinal and transverse folds, lateral margins smooth, nearly parallel. Foot plate short, with rounded coxal plates. Prepedal fold elongate, narrow, posteriorly with median projection. Foot pseudosegment simple, not projecting. Toe single, widest basally, narrowing medially, ending in two inconspicuously separated, occasionally unequal pseudoclaws.

Measurements: DPl. 60-70, DPw. 60-67, VPl. 65-75, VPw. 50-53, toe l. (incl. claw.) 29-35, claw l. 3-5.

Distribution
Only known from Guyana and Jamaica. The species lives between submerged mosses or in *Nepenthes*-'cans' (phytotelmata).

Comments
The original description of *L. asymmetrica* reports it to have unequal claws (Murray, 1913a). This is probably a malformation, and cannot be considered taxonomically relevant. Lorica and toe shape clearly characterize the taxon. As such, *L. janetzkyi* is considered a synonym of *L. asymmetrica*, although it has equal toes.

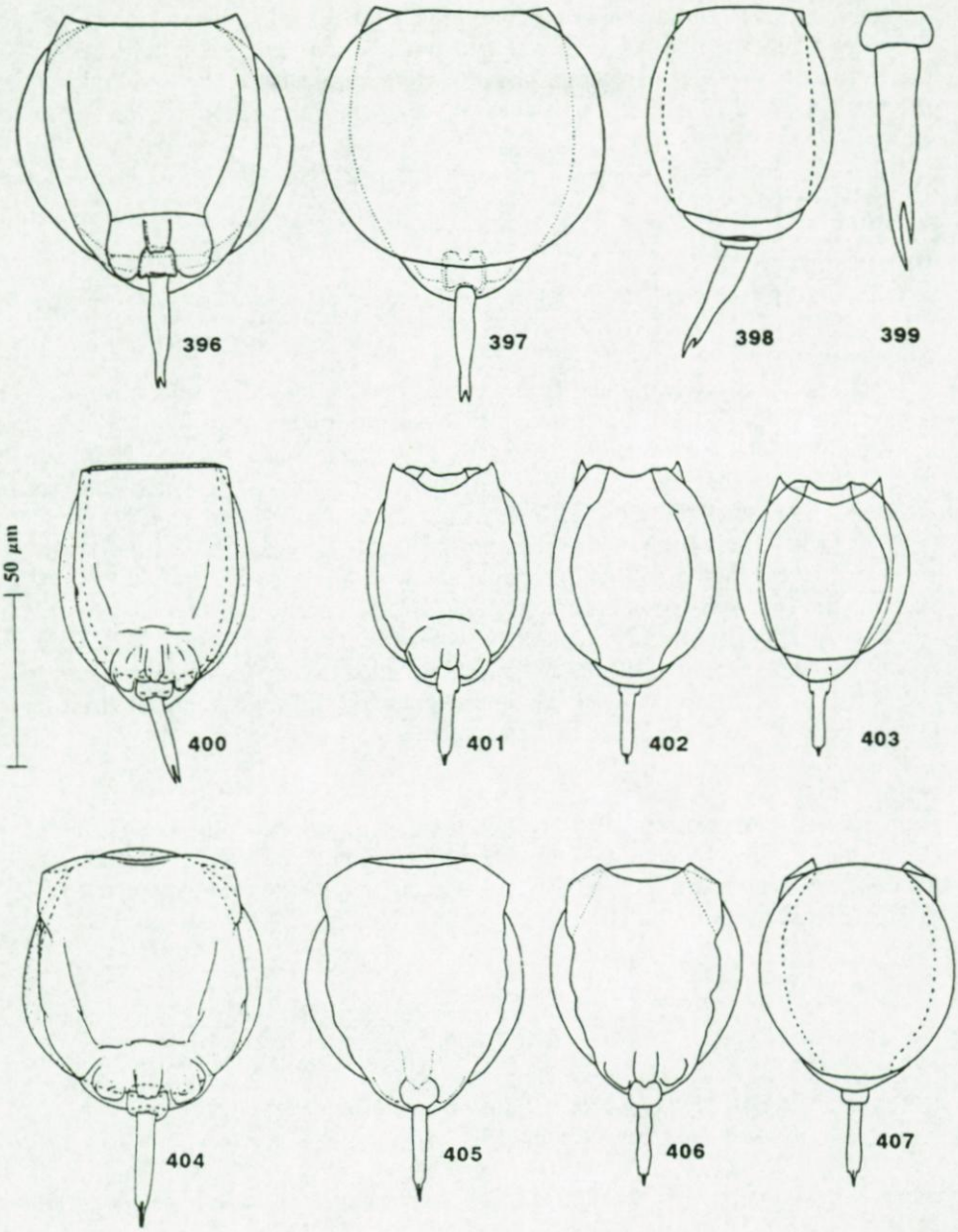
118. *Lecane lamellata* (Daday, 1893)
Figs 3, 17, 63, 408, 410-411.

Synonym: *L. appendiculata* (Skorikov, 1898) non Levander, 1894

Daday 1893 p. 40 plate 2 figs 1, 2 (*Monostyla lamellata*); Skorikov 1898 p. 556 text fig. (*Monostyla appendiculata*); Murray 1913c p. 562; Harring & Myers p. 392-393 plate 39 figs 5, 6; Rodewald 1940 p. 281-288 figs 7-11; Wiszniewski 1954 p. 66 (*Lecane lamellata*); De Ridder 1960 p. 180-184 fig. 6; Kutikova 1970 p. 472 fig. 667; Koste 1978 p. 254 plate 83 figs 9a, b; Segers & Dumont 1993b p. 17-18 figs 10a-g (partim).

Differential diagnosis
L. lamellata is close to *L. thalera*, but is easily recognised by the presence of a distinct posterior projection of the foot plate.

Description
Lorica stiff. Dorsal plate anteriorly narrower, medially slightly wider than ventral plate, smooth. Head aperture margin dorsally and ventrally strongly concave, antero-lateral corners with sharp spines. Lateral margins of dorsal plate do not reach head aperture. Ventral plate elongate, with a weak, incomplete transverse fold, smooth.



Figs 396-399: L. asymmetrica. 396: ventral view, 397-398: dorsal view, 399: toe.
Fig. 400: L. gwileti, ventral view.
Figs 401-403: L. margarethae. 401: ventral view, 402-403: dorsal view.
Figs 404-407: L. punctata. 404-406: ventral view, 407: dorsal view.
(396-397: after Koste *et al.*, 1991 (sub. *L. janetzkyi*); 398-399: after Murray, 1913a; 400: 'Leiemeersen', Oostkamp, Belgium; 401-403: after Ahlstrom, 1934 (sub. *L. punctata*); 404: Saudi Arabia (Segers & Dumont, 1993b.); 405: after Harring & Myers, 1926; 406-407: after Hauer, 1956 (sub *L. harringi*)).

Lateral margins smoothly curved. Foot region broad, coxal plates rounded triangular. Prepedal fold short, broad, with rounded posterior margin. Posterior edge of foot plate truncate, with conspicuous postero-lateral projections. Foot pseudosegment simple, not projecting. Toe single, bearing long, fused pseudoclaws and accessory claws.

Measurements: DPl. 142-168, DPw. 108-128, VPl. 158-190, VPw. 110-120, toe l. 42-58, claw l. 14-17.

Distribution

L. lamellata is cosmopolitan, living in the littoral of saline waters.

Comments

A synonymy of *L. lamellata* and *L. thalera* has been proposed by several authors, and is based on records of specimens having posterior projections of intermediate shape between both (De Ridder, 1960; Rodewald, 1940; Segers & Dumont, 1993b: see figs 410-415). Such specimens are relatively rare compared to *L. lamellata* and *L. thalera*. The case is therefore different from that in *L. ligona*, *L. ludwigii* and *L. leontina*, where the shape of the posterior projection appears to be simply variable. An alternative hypothesis, that the specimens with intermediate morphology are hybrids of the two taxa, should be considered in addition to the classical one that assumes, but cannot confirm (Rodewald, 1940; De Ridder, 1960; Koste, 1978), a correlation between salinity of the habitat and morphology of the posterior projection.

In the light of the above, I believe that taxonomic stability is at present best served by dealing with the two taxa as separate species.

Note

L. flabellata Edmondson, 1936 (figs 416-417), described from the psammon of Pennamaquan Lake, Maine, U.S.A., resembles *L. lamellata*, but is distinguished by the different head aperture and by the toe ending in a single, minute spicule.

Measurements: DPl. 72, DPw. 60, VPl. 96, VPw. 60, toe l. 36.

119. *Lecane thalera* (Harring & Myers, 1926)

Figs 409, 415

Synonyms: *L. conspicua* (Hauer, 1936b) Wiszniewski, 1954
L. paradecipiens (Nayar, 1968) (n. syn.)

Harring & Myers p. 393-394 plate 39 figs 3, 4 (*Monostyla thalera*); Hauer 1936b p. 78-79 figs 2a, b (*M. conspicua*); Rodewald 1940 p. 281-288 figs 7-11; Myers 1942 p. 265 (*Lecane thalera*); Wiszniewski 1954 p. 71; 72 (*L. thalera conspicua*); Hauer 1956 p. 301-302 figs 17a, b (*M. thalera*); De Ridder 1960 p. 180-184 fig. 6; Nayar 1968 p. 180-181 figs 20, 21 (*Monostyla paradecipiens*); Kutikova 1970 p. 474 fig. 670 (*M. thalera*); Koste 1978 p. 254 plate 83 figs 5a, b, 7a, b (*L. (M.) lamellata thalera*); José de Paggi 1989 p. 234-235 figs 17-22 (*L. thalera*); Segers & Dumont 1993b p. 19-20.

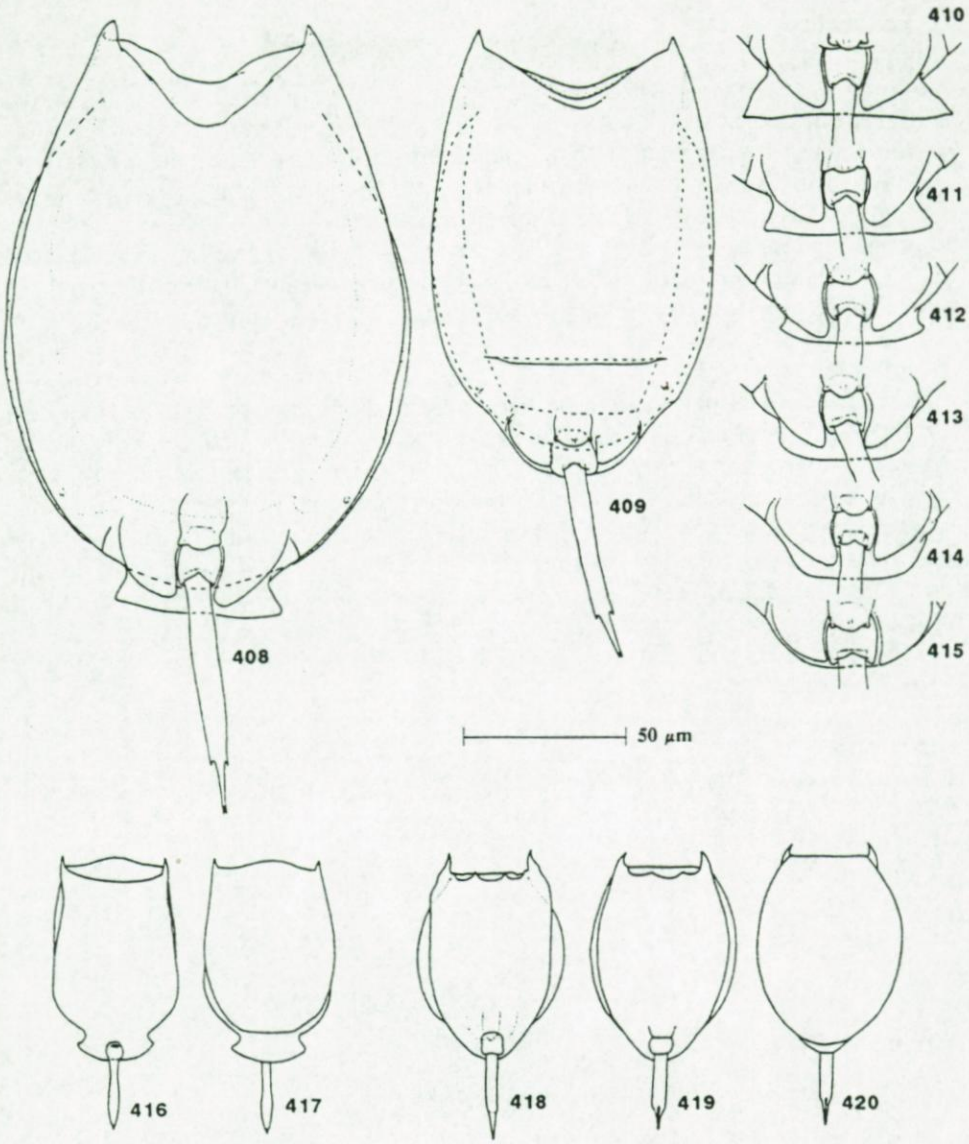


Fig. 408: L. lamellata, ventral view.
Fig. 409: L. thalera, ventral view.
Figs 410-415: L. lamellata, L. thalera and intermediates, foot region.
Figs 416-417: L. flabellata. 416: ventral view, 417: dorsal view.
Figs 418-420: L. ivli. 418-419: ventral view, 420: dorsal view.
(408, 410-415: after Segers & Dumont, 1993b; 409: Lake Kolleru, India; 416-417: after Edmondson, 1936; 418: after Török, 1935 (sub. *L. vargai*); 419-420: after Wiszniewski, 1935).

Type locality
Lago de San Cristóbal, near Mexico City, Mexico.

Differential diagnosis
L. thalera can be confused with *L. lunaris*. It differs from the latter by the lateral margins of its dorsal plate not reaching the head aperture; from *L. nigeriensis* by its strongly concave dorsal and ventral anterior margins.

Although related to *L. lamellata*, *L. thalera* cannot be confused by the characteristic rounded posterior margin of its foot plate. A difference in shape of the head aperture as in figures 408 and 409 is probably of no diagnostic value.

Description
Lorica stiff. Dorsal plate anteriorly narrower, medially more or less as wide as the ventral plate, both smooth. Head aperture margins dorsally and ventrally strongly concave, antero-lateral corners acutely pointed. Lateral margins of dorsal plate do not reach head aperture. Ventral plate elongate, transverse fold incomplete. Lateral margins smooth, curved. Foot region broad, coxal plates rounded or acutely triangular, occasionally projecting. prepedal fold short, broad, with rounded posterior margin. Posterior edge of foot plate smoothly rounded. Foot pseudosegment simple, not projecting. Toe single, bearing long, fused pseudoclaws and accessory claws.

Measurements: DPl. 103-157, DPw. 89-128, VPl. 130-173, VPw. 80-120, toe l. 42-64, claw l. up to 16.

Distribution
L. thalera is cosmopolitan. The species lives in slightly saline, but also in fresh water, in contrast to *L. lamellata*.

Comments
See under L. lamellata.

120. *Lecane ivli* (Wiszniewski, 1935)
Figs 418-420

Synonym: *L. vargai* (Török, 1935) Bancsi, 1988 (n. syn.)

Wiszniewski 1935 p. 243-244 fig. 2 (*Monostyla ivli*); Török 1935 638-639 figs 1a, b, 2 (*Monostyla vargai*); Wiszniewski 1954 p. 66 (*Lecane ivli*); Živković 1987 p. 67-68 figs 61a, b; Bancsi 1988 p. 377 figs 432a-c (*L. vargai*).

Type locality
Lake Ohrid, Ohrid, Former Yougoslav Republic of Macedonia.

Differential diagnosis
According to Wiszniewski (1935), the species is close to *L. punctata* (Murray) after Ahlstrom (= *L. margarethae*), but differs by its characteristic head aperture margins, and by the short and broad foot pseudosegment.

Description
Lorica stiff. Dorsal plate anteriorly narrower, medially wider than ventral plate, smooth. Head aperture margin dorsally straight, ventrally with a pair of broad, pointed projections, antero-lateral corners with sharp spines. Lateral margins of ventral plate smooth, slightly curved. Prepedal fold narrow, elongate, distally with median projection, coxal plates rounded. Foot pseudosegment simple, not projecting. Toe cylindrical, relatively short. Claws relatively long, completely separated.

Measurements: DPl. 71-86, DPw. 42-68, VPl. 79-89, VPw. 50-62, frontal spine l. 7, toe l. 24, claw l. 12.

Distribution
Known from lake Ohrid, waters in Serbia and from tap water in Budapest (Hungary). A non-illustrated record from Poland.

Comments
In order to conserve stability in nomenclature, the most frequently used name, *L. ivli*, is chosen as preceding *L. vargai*.

121. *Lecane scutata* (Harring & Myers, 1926)
Figs 429-431

Synonym: *L. stroeszneri* (Török, 1935) Bancsi, 1988 (n. syn.)

L. perplexa after Pejler (1962)
non *L. scutata* after Chengalath *et al.* (1974), Koste (1972), Pejler (1962)

Harring & Myers 1926 p. 401 plate 40 figs 1, 2; Hauer 1931 p. 12-13 figs 6a, b; Wiszniewski 1934b p. 386 plate 63 figs 82, 83; Török 1935 p. 640-641 fig. 3 (*Monostyla stroeszneri*); Myers 1942 p. 265 (*Lecane scutata*); Kutikova 1970 p. 471-472 fig. 644; Koste 1978 p. 245 (partim) plate 81 fig. 12; Sharma 1979 p. 57-58 figs 15, 16; Bancsi 1988 p. 380 figs 436a-b (*L. stroeszneri*); p. 383 figs 443a-c; Koste & Shiel 1990 p. 11 plate 4 fig. 6 (*Monostyla scutata*).

Type locality
Ottman Lake, near Waupaca, Wisconsin, U.S.A.

Differential diagnosis
L. scutata resembles *L. furcata* in general shape and size, but differs by having longitudinal folds on the ventral plate, a different prepedal fold and toe, and shallower lateral sulci. The species is related to *L. copeis*, which has a different toe and head aperture margins.

Description
Lorica stiff, smooth. Dorsal plate anteriorly narrower, medially wider than ventral plate. Head aperture margins nearly coincident, slightly concave or straight, antero-lateral corners angulate. Ventral plate longer than wide, with nearly complete transverse fold. Lateral margins straight, smooth, almost parallel-sided, with weak ante-

rior notches. Lateral sulci shallow. Foot plate short, with rounded triangular coxal plates. Prepedal fold broad, rounded distally. Foot pseudosegment simple, non-projecting. Toe single, widest in its basal half, bearing two claws.

Measurements: DPl. 62-74, DPw. 62-76, VPl. 67-82, VPw. 50-70, Anterior edge w. 46-48, toe l. 24-32, claw l. 5-7.

Distribution

Insufficiently known, due to frequent confusion with *L. furcata*. The species is probably cosmopolitan.

122. *Lecane lunaris* (Ehrenberg, 1832)

Figs 421-428, 438

Synonyms: *L. quennerstedti* (Bergendal, 1892)
L. constricta (Murray, 1913c) Myers, 1942
L. acus (Harring, 1913b) Myers, 1937
L. crenata (Harring, 1913b) Edmondson, 1935
L. sylvatica (Harring, 1913b) Wiszniewski, 1954
L. virga (Harring, 1914)
L. lunaris obserata (Steinecke, 1916) Voigt, 1957
L. perplexa (Ahlstorm, 1938) Myers, 1942
L. lunaris australis Bērziņš, 1982a
L. lunaris arthrodactyla Bērziņš, 1982b

L. scutata after Pejler (1962)
non *L. lunaris* after Brandorff *et al.* (1982)
non *L. perplexa* after Pejler (1962)

Infrasubspecific taxon: f. *granulata* Koste, 1978.

Ehrenberg 1832 p. 127 (*Lepadella lunaris*); Ehrenberg 1838 p. 460 plate 57 fig. 6 (*Monostyla lunaris*); Bergendal 1892 p. 118 plate 6 fig. 39 (*Monostyla quennerstedti*); Murray 1913a p. 353 plate 15 figs 31a, b; 1913c p. 557 plate 22 fig. 10 (*Monostyla consticta*); Harring 1913a p. 73; Harring 1913b p. 398 plate 36 figs 1-3 (*Monostyla acus*); p. 399 plate 35 figs 1-3 (*Monostyla sylvatica*); p. 399 plate 36 figs 4-6 (*Monostyla crenata*); Harring 1914 p. 546 plate 24 figs 1-3 (*Monostyla virga*); Steinecke 1916 p. 89-90 figs 2e, f (*Monostyla lunaris* f. *obserata*); Harring & Myers 1926 p. 384-386 plate 35 figs 1-6; p. 386-387 plate 36 figs 5, 6 (*M. crenata*); p. 387-388 plate 36 figs 3, 4 (*M. acus*); p. 398 plate 40 figs 3, 4 (*M. sylvatica*); Hauer 1929 p. 157-158 figs 15a, b; Edmondson 1935 p. 302 (*Lecane lunaris*); Myers 1937 p. 3; Ahlstrom 1938 p. 101-102 plate 7 fig. 4 (*Monostyla perplexa*); Carlin 1939 p. 28 figs 7e-h; Myers 1942 p. 263, 264; Wiszniewski 1954 p. 68 (incl. *L. lunaris constricta*, *L. lunaris crenata*, *L. lunaris perplexa*); p. 71; Voigt 1957 p. 235 plate 42 fig. 9, plate 43 fig. 30, plate 45 fig. 12; plate 43 figs 32a-b (*L. lunaris* f. *obserrata*); Pejler 1962 p. 368 figs 95-100, 105; Kutikova 1970 p. 476 fig. 676 (*L. (M.) crenata*); p. 477 fig. 678 (*L. (M.) acus*); p. 478 fig. 677, fig. 681 (*L. (M.) constricta*); Koste 1978 p. 248-250 plate 81 figs 14-16, plate 82 figs 1a-j, 2a-f, plate 85 figs 3, 5c, 7

(incl. f. *granulata*, var. *constricta*, f. *perplexa*); p. 249-250 plate 82 figs 4a, b (*L. (M.) lunaris crenata*); p. 250 plate 82 figs 3a, b (*L. (M.) acus*); Bērziņš 1982a p. 9 fig. 20 (*L. (M.) lunaris australis*); Bērziņš 1982b p. 15 fig. 20 (*L. lunaris arthrodactyla*); Koste & Shiel 1990 p. 3-4 plate 1 fig. 1 (*Monostyla acus*); p. 7 plate 2 fig. 3 (*Monostyla crenata*); p. 8-9 plate 3 fig. 3 (*Monostyla lunaris*; incl. *M. lunaris constricta* and *M. lunaris perplexa*).

Differential diagnosis

L. lunaris can be confused with the following species:

- *L. cornuta*: has a complete transverse fold on the ventral plate, and, mostly, broad-based antero-lateral spines. The general lorica shape is, in most cases, nearly circular;
- *L. scutata*: is smaller, its lateral sulci are less profound or even absent and it has weak lateral notches in the anterior region of the ventral plate;
- *L. thalera*: the lateral margins of this species' dorsal plate do not reach the head aperture margin, its antero-lateral projections are more prominent;
- *L. nigeriensis*: the lateral margins of the dorsal plate do not reach the head aperture margin, the ventral head aperture margin is broadly bilobate and may projects beyond the dorsal;
- *L. rhopalura*: has a bulged toe (parallel-sided in *L. lunaris*).

Description

Loricate *Lecane*. Dorsal plate anteriorly narrower, medially as wide as, or slightly wider than ventral plate, smooth or ornamented. Head aperture margins straight to concave dorsally, slightly to strongly concave ventrally, antero-lateral corners angulate. Lateral edges of dorsal plate reach head aperture. Ventral plate longer than wide to elongate, transverse fold incomplete, smooth or ornamented. Lateral margins smooth, nearly parallel-sided to strongly curved. Lateral sulci deep. Foot plate broad, coxal plates rounded triangular, posterior margin smoothly rounded, truncate or bilobate. Prepedal fold broad, posterior margin rounded. Foot pseudosegment slightly elongate, nearly parallel-sided. Toe length variable, mostly relatively long, parallel-sided, bearing incompletely separated, needle-like pseudoclaws and accessory claws.

Measurements: DPl. 87-129, DPw. 70-119, VPl. 94-137, VPw. 54-104, toe l. 42-80, claw l. 6-12. (f. *perplexa*: DPl. 63-83, DPw. 44-73, VPl. 62-88, VPw. 50-63, claw l. 4-7).

Distribution

Cosmopolitan, one of the commonest and most eurytopic *Lecane*'s. The species can occasionally be found in the plankton.

Comments

The variability in lorica shape and toe length is important in *L. lunaris*, which is reflected in the high number of taxa distinguished. As specimens with intermediate morphology between them are commonly encountered, and as it is at present not possible to provide a definite diagnosis for these taxa, they are here considered synonyms. Nevertheless, the following variants can be distinguished (compare with figure 438: 'typical' form).

- f. *acus*: toe relatively long, head aperture margins coincident, slightly concave. Occurs between mosses in acid waters (figure 422).
- f. *constricta*: toe relatively long. Lorica rounded, dorsal plate strongly converging anteriorly. A benthic form (figure 427).
- f. *crenata*: toe relatively long, ventral head aperture margin deeply concave. Between submerged vegetation (figure 421).
- f. *perplexa*: relatively small. Dorsal head aperture margin straight or slightly convex, ventrally slightly concave. Ecology not known (figure 428).

The taxonomic position and ecological relevance of these variants remains unsatisfactorily resolved, irrespective of numerous valuable contributions to the subject (Hauer, 1929; Carlin, 1939; Pejler, 1962; Ovander, 1980b).

123. *Lecane pideis* (Harring & Myers, 1926)
Figure 434-435

Harring & Myers 1926 p. 400 plate 41 figs 5, 6 (*Monostyla pideis*); Myers 1942 p. 264 (*Lecane 'pedeis'*).

Type locality and type
Bubble pond, Mount Desert Island, Maine, U.S.A. Paratype in PANS.

Differential diagnosis
L. pideis resembles *L. cornuta* or *L. lunaris*, but can hardly be mistaken for any of these by its characteristic toe and shape of dorsal head aperture margin.

Description
Loricate *Lecane*. Dorsal plate medially slightly wider than ventral plate, smooth. Head aperture margin strongly concave ventrally, with a squarish median invagination dorsally. Antero-lateral corners with sharp spines. Ventral plate longer than wide, transverse fold incomplete, smooth. Lateral margins smooth, strongly curved. Foot plate relatively narrow. Foot pseudosegment squarish. Toe thick, parallel-sided, bearing completely separated, fused claws.

Measurements: DPl. 122, DPw. 108, VPl. 122, VPw. 100, toe l. 45, claw l. 6.

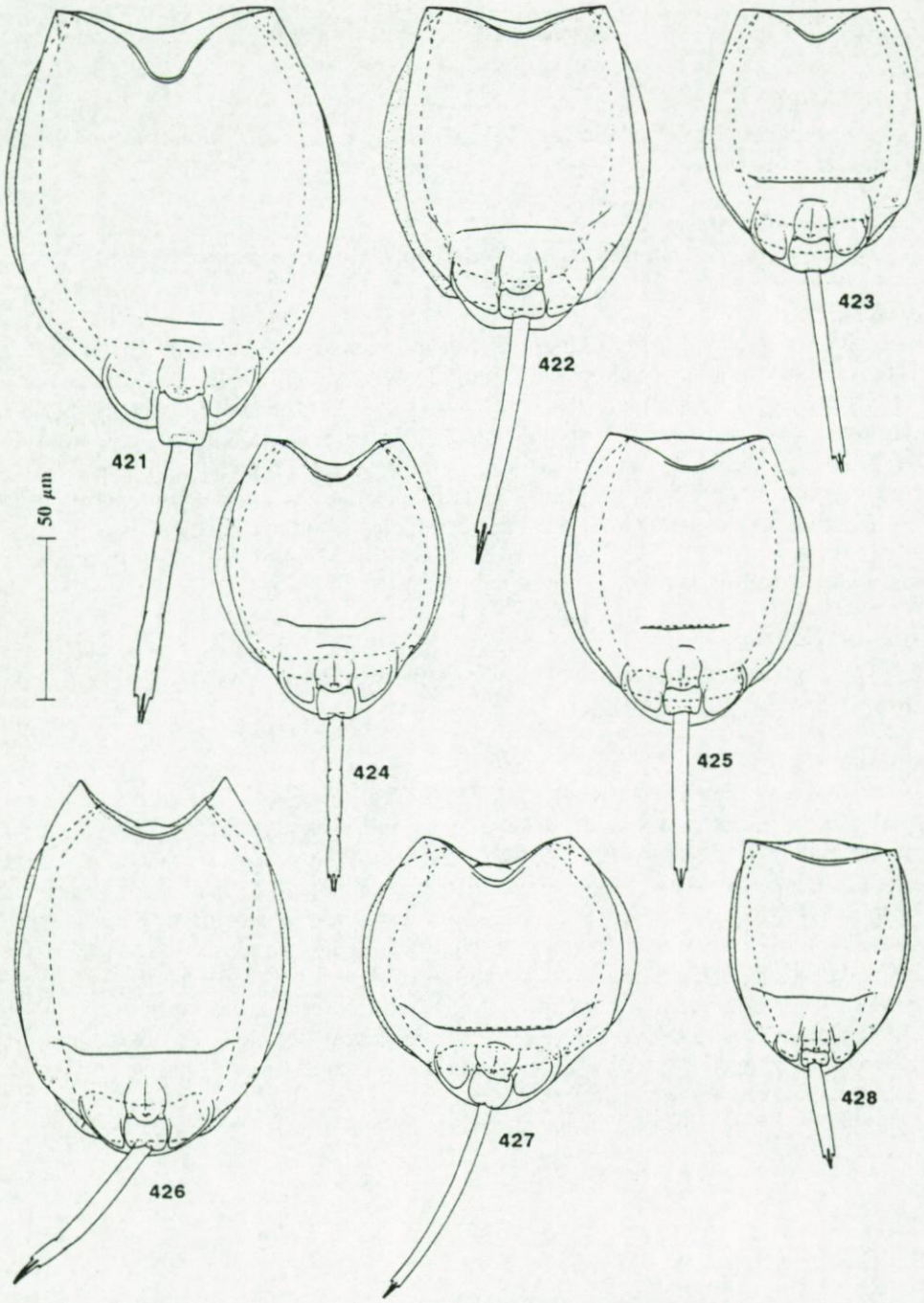
Distribution
A single record from the type locality only.

124. *Lecane rhopalura* (Harring & Myers, 1926)
Figs 436-437

Synonym: *L. aspersa* Kutikova & Arov, 1985 (n. syn.)

L. closterocerca after Jennings (1894), Hempel (1899)

Harring & Myers 1926 p. 399-400 plate 41 figs 3, 4 (*Monostyla rhopalura*);



Figs 421-428: L. lunaris, ventral view. 421: f. *crenata*; 422: f. *acus*; 427: f. *constricta*; 428: f. *perplexa*. (see also fig. 438).
(421: Roadside pool between Kumara and Greymouth, New Zealand, leg. & det. L. Sanoamuang; 422: 'Ronde Put', Postel, Belgium; 423, 425, 427: after Segers, 1993; 424: Rio Jatapú, Amazonas, Brazil; 426: pond near Lake Glubokoe, Russia; 428: Lago Jacundá, Rio Tapajós, Pará, Brazil).

Wiszniewski 1954 p. 70 (*Lecane rhopalura*); Kutikova & Arov 1985 p. 50-52 figs 1a-d (*L. (M.) aspersa*).

Type locality
Around Atlantic City, New Jersey; Vilas County, Wisconsin; Mount Desert Island, Maine, U.S.A.

Differential diagnosis
L. rhopalura can be distinguished from *L. lunaris* by its bulged toe.

Description
Loricate *Lecane*. Dorsal plate anteriorly narrower, medially wider than or as wide as ventral plate, smooth. Head aperture margins concave, antero-lateral corners sharp. Lateral edges of dorsal plate reach head aperture. Ventral plate longer than wide, transverse fold incomplete, smooth. Lateral margins smooth, curved. Lateral sulci deep. Foot plate broad, coxal plates rounded triangular. Prepedal fold broad, posterior margin rounded. Foot pseudosegment simple. Toe long, dilated medially, bearing incompletely separated, needle-like pseudoclaws and accessory claws.

Measurements: DPl. 113-134, DPw. 91-106, VPl. 125-146, VPw. 88-95, ant. margin width dorsally 36-44, ventrally 50-59, toe l. 46-53, claw l. 8-11.

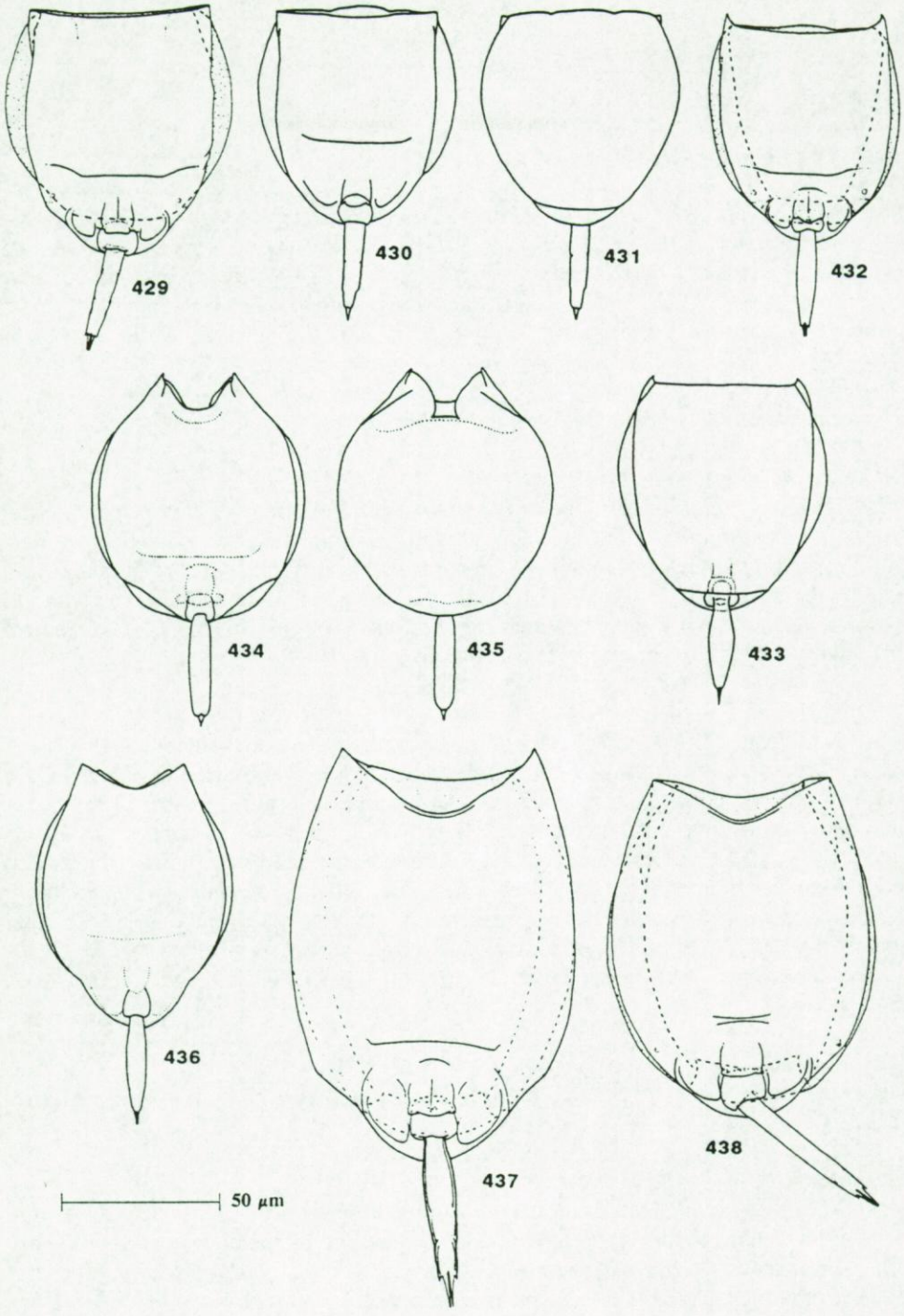
Distribution
Known from several localities in North America, Russia (Lake Glubokoe, Lake Baikal), and the Bolivian Andes.

Comments
L. aspersa was diagnosed by having a sculptured lorica (covered with small pits), small antero-lateral spines, and by the toe bearing two separate claws. Judging from the photograph of *L. aspersa* by Kutikova & Arov (1985), the ornamentation of the lorica is relatively weak. Moreover, similarly ornamented *L. lunaris* (f. *granulata* Koste, 1978), a species to which *L. aspersa* is close, have been recorded and are considered to be of no special taxonomic significance. A variability in shape of the antero-lateral 'spines' is recorded by Kutikova & Arov (1985) themselves, these spines are not significantly more pronounced than in *L. rhopalura* (see also fig. 15 in Chengalath & Koste, 1988). The toe is reported to bear two separate pseudoclaws in *L. rhopalura* as well as in *L. aspersa*. Moreover, a comparison of Russian and Bolivian animals revealed no significant differences.

In the light of the above, *L. aspersa* is here treated as a synonym of *L. rhopalura*.

→

Figs 429-431: L. scutata. 429-430: ventral view, 431: dorsal view.
Figs 432-433: L. copeis, ventral view.
Figs 434-435: L. pideis. 434: ventral view, 435: dorsal view.
Figs 436-437: L. rhopalura, ventral view.
Fig. 438: L. lunaris, ventral view.
(429: pond near Lake Glubokoe, Russia; 430-431: after Wiszniewski, 1934b; 432: Lago Jacundá, Rio Tapajós, Pará, Brazil; 433: after Koste & Böttger, 1992 (sub. *L. eupsammophila*); 434-436: after Harring & Myers, 1926; 437: laguna Kothia, La Paz sud, Bolivia; 438: Turkey (Segers *et al.*, 1992)).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50 µm

125. *Lecane copeis* (Harring & Myers, 1926)
Figs 432-433

Synonym: *L. eupsammophila* Koste, 1992 (n. syn.)

cf. *L. acanthinula* after Koste (1972)

Harring & Myers 1926 p. 398-399 plate 41 figs 1, 2 (*Monostyla copeis*); Wiszniewski 1954 p. 64 (*Lecane copeis*); Kutikova 1970 p. 468-469 fig. 656; Koste 1978 p. 245 plate 81 figs 10a, b; Koste & Shiel 1990 p. 7 plate 2 fig. 1 (*Monostyla copeis*); Koste & Böttger 1992 p. 292-293 fig. 12 (*L. eupsammophila* (Koste, 1991)); Turner & Da Silva 1992 p. 236-239 figs 3a, b.

Type locality
Prospect Lake, Pikes Peak, Colorado; Lake Pepin, Wisconsin, U.S.A.

Differential diagnosis
The size and general lorica shape of *L. copeis* is reminiscent of *L. furcata* (and, especially, *L. acanthinula*), but the species is readily distinguished by its toe being widest in the middle and bearing relatively short claws, its different type of prepedal fold and by the absence of longitudinal folds on the ventral plate. *L. copeis* is related to *L. scutata*, they differ by their different toe and head aperture margins. *L. rhopalura* also has a bulged toe but its lorica is different.

Description
Lorica stiff, smooth. Dorsal plate anteriorly narrower, medially wider than ventral plate. Head aperture margins nearly coincident, more or less straight, occasionally slightly convex dorsally. Small antero-lateral spines present. Ventral plate longer than wide, transverse fold incomplete. Lateral margins smooth or irregularly undulate, nearly parallel. Lateral sulci mostly shallow, occasionally deep. Foot plate short, with rounded triangular coxal plates. Prepedal fold broad, short, with smoothly rounded posterior margin. Foot pseudosegment simple, not projecting. Toe single, widest medially, bearing two small claws and minute accessory claws.

Measurements: DPl. 75-88, DPw. 72-80, VPl. 86-94, VPw. 60-65, toe l. 29-33, claw l. 4-6.

Distribution
Recorded from North and South America, Europe and Australia. the species is rather rare.

Comments
Koste & Böttger (1992) differentiated *L. eupsammophila* from *L. copeis* by the presence of anterolateral spines, by having a longer toe and by the claws being relatively long. Their report on *L. copeis* is, however, incorrect and *L. eupsammophila* does not differ from *L. copeis* in the cited aspects (compare fig. 433 with fig. 432, plate 31 fig. 4 in Koste (1972), fig. 3 in Turner & Da Silva (1992) and figs 9e, f in Segers & Dumont (1993b)). Small differences in proportions between *L. eupsammophila* and *L. copeis* are insufficient to warrant separation of the two.

126. *Lecane cornuta* (Müller, 1786)
Figs 439-443

Synonyms: *L. glumiformis* (Bory de st. Vincent, 1827)
L. robusta (Stokes, 1896)
L. rotundata (Jakubski, 1914)
L. rotunda (Fadeev, 1927) Voigt, 1957
L. cornuta oidipus Hauer, 1956

Müller 1786 p. 208 plate 30 figs 1-3 (*Trichoda cornuta*); Bory de St. Vincent 1827 p. 484 (*Lepadella glumiformis* = *T. cornuta* renamed); Stokes 1896 p. 22 plate 7 figs 6-8 (*Monostyla robusta*); Harring 1914 p. 545; Jakubski 1914 p. 34 plate 1 fig. 6 (*Monostyla rotundata*); Harring & Myers 1926 p. 396-397 plate 40 figs 5, 6; Fadeev 1927 p. 149-150 plate 1 figs 13-15 (*Monostyla rotunda*); Hauer 1929 p. 159-163 figs 17a, b; Edmondson 1936 p. 214 (*Lecane cornuta*); Hauer 1956 p. 299-300 figs 15a-c (var. *oidipus*); Voigt 1957 p. 238; Kutikova 1970 p. 475 fig. 672; p. 476 fig. 675 (*L. (M.) cornuta rotunda*); fig. 671 (*L. (M.) cornuta oidipus*); Koste 1978 p. 251-252 plate 83 figs 1a, b; 1c-e (var. *oidipus*); figs 1f, g (var. *rotunda*); Koste & Shiel 1990 p. 7 plate 2 fig. 2 (*Monostyla cornuta*).

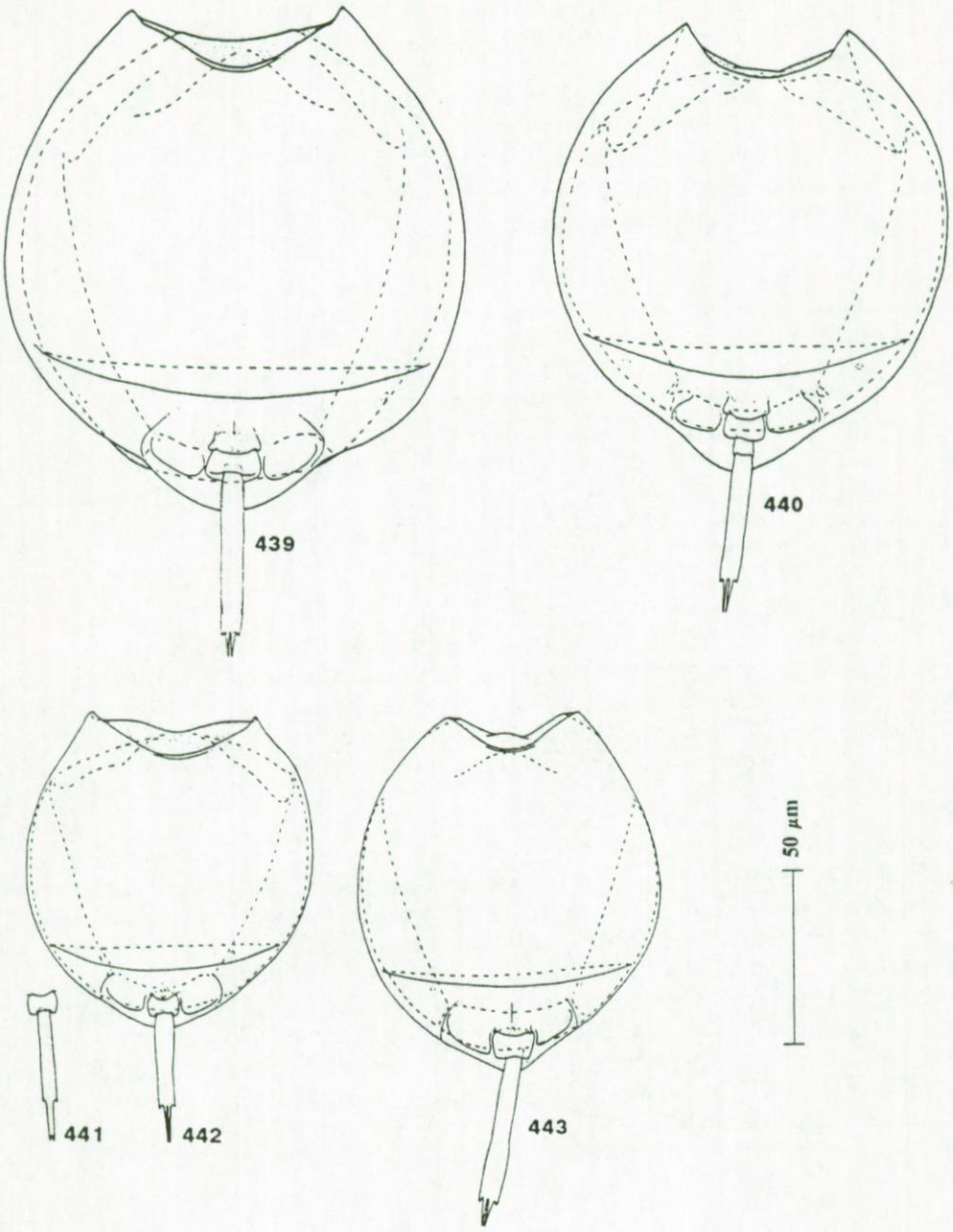
Differential diagnosis
L. cornuta can easily be confused with *L. lunaris*; it is characterised by a strong, complete transverse fold (incomplete in *L. lunaris*), an almost circular lorica and by the lateral margins of its dorsal plate strongly converging to anteriorly. When compared to *L. stenroosi*, the lorica of *L. cornuta* is relatively rounder, and the species lacks the characteristic anterior projections of *L. stenroosi*. These two species also have a different foot plate.

Description
Lorica stiff, smooth, circular. Dorsal plate narrower than ventral plate. Head aperture margins nearly coincident, concave, dorsal occasionally with protruding median part. Antero-lateral corners sharp, with broad-based spines, these occasionally inconspicuous. Ventral plate nearly as wide as long, widest medially, with strong, complete transverse fold. Lateral margins smooth, strongly curved. Lateral sulci deep. Foot plate broad, coxal plates rounded triangular. Prepedal fold short, broad, with smoothly rounded posterior margin. Foot pseudosegment simple, not projecting. Toe single, parallel-sided or with local constrictions. Claws mostly separate, rarely fused, accessory claws present.

Measurements: DPl. 102, DPw. 88-110, VPl. 85-128, VPw. 105, toe l. 23-46, claw l. 8-10.

Distribution
Presumably cosmopolitan, records from Africa are few. A definite range for this species can, at present, not be provided due to frequent misidentifications (see Hauer 1929, 1956).

Comments
The taxonomic status of the 'varieties' *rotunda* (e.g., as in fig. 442) and *oidipus* (as in fig. 440: see Koste, 1978) needs revision.



Figs 439-443: L. cornuta, ventral view. 441: toe. 439: f. *oidipus*, 442: f. *rotunda*,
(439: Lake Nicaragua, near Granada, Nicaragua; 440: Rio Jatapú, Amazonas, Brazil; 441-443: Rio Abobral, Pantanal region, Brazil).

127. *Lecane armata* Thomasson, 1971
Figs 444-445

Thomasson 1971 p. 51 plate 24 figs 6, 7; Koste 1974 p. 33-34 figs 15a-c (*L. gillardi armata*); Koste 1978 p. 251 plate 82 figs 6c-e (*L. gillardi armata*).

Type locality
Lago Jurucui, Rio Tapajós, Brazil.

Differential diagnosis
L. armata resembles *L. cornuta* or *L. lunaris*, but is easily distinguished by its spiny lorica. The shape of its head aperture, with both the ventral and dorsal anterior margins concave, differentiates the taxon from *L. gillardi*, and from the similarly ornamented *L. sylviae*.

Description
Dorsal and ventral plates round, lateral sulci deep. Dorsal plate narrower than ventral plate. Dorsal and ventral head aperture margins slightly concave. Lorica with distinct pattern consisting of rows of spicules. Ventral plate longer than wide, transverse fold complete, lateral margins smoothly rounded. Foot pseudosegment not projecting. Toe parallel-sided, with pseudoclaws and accessory claws.

Measurements: DPl. 96-100, DPw. upto 85, VPl. 104, VPw. 92-100, toe l. 40-64, claw l. 16.

Distribution
Restricted to the Amazon region, where it is rare.

128. *Lecane gillardi* Bērziņš, 1960
Figs 446-447

Bērziņš 1960 p. 3-4 figs 4, 5; Koste 1978 p. 251 plate 82 figs 6a, b.

Type locality
Laguna Lanirano and pond near Tananarive, Madagascar.

Differential diagnosis
L. gillardi bears little resemblance to any other *Lecane*, but *L. armata*. The species differ by the shape of their head aperture.

Description
Lorica with clear pattern of rows of spicules. Dorsal and ventral plates round, lateral sulci deep. Dorsal plate narrower than ventral plate. Head aperture margin dorsally convex, with a median rectangular projection, ventrally concave. Ventral plate slightly longer than wide, transverse fold complete. Foot pseudosegment not projecting. Toe parallel-sided, with pseudoclaws and accessory claws.

Measurements: DPl. 118, DPw. 91, VPl. 118, Vlw. 100, toe l. 52, claw l. 8.

Distribution
L. gillardi is a madagassian endemic.

129. *Lecane amazonica* (Murray, 1913a)
Figure 448

Synonym: *L. murrayi* Hauer, 1965a non Korde, 1927

Infrasubspecific taxon: *L. murrayi* Hauer non Korde f. *larga* Koste, 1978

Murray 1913a p. 354 plate 15 figs 32a, b (*Monostyla amazonica*); Voigt 1957 p. 238 (*Lecane amazonica*); Hauer 1965a p. 41, 42 figs 1a, b (*L. murrayi* Hauer nom. nov., non Korde); Hauer 1965b p. 362, 363 figs 19a-c (*L. murrayi*); Koste 1972 p. 390-391 plate 28 fig. 1 (*L. murrayi*); Koste 1978 p. 247 plate 80 figs 5a-d (*L. murrayi* and f. *larga*); Segers 1993 p. 51-52.

Type locality
Amazon river, Brazil.

Differential diagnosis
The species is close to *L. unguitata* and *L. stenroosi*, but differs from these by the structure of its ventral head aperture margin being broadly sinuate or biconvex. It differs from *L. nigeriensis* by its more rounded lorica, by the lateral margins of its dorsal plate reaching the anterior margin, and its different foot plate and toe.

Description.
Lorica stiff. Dorsal plate nearly as wide as ventral. Head aperture margin dorsally straight, ventrally biconvex, antero-lateral corners rounded. Dorsal plate round, smooth. Ventral plate longer than wide, transverse fold complete, lateral margins smooth, curved. Lateral sulci deep. Foot plate broad, with small, rounded triangular coxal plates. Prepedal fold short, posteriorly smoothly rounded. Foot pseudosegment trapezoidal, not projecting. Toe single, parallel-sided. Pseudoclaws relatively long, accessory claws present.

Measurements: DPl. 87-106, DPw. 75-97, VPl. 97-129, VPw. 77-100, toe l. 41-55, claw l. 14-16.

Distribution
Endemic to the Amazon region, where it is not uncommon.

Comments
The taxonomic status of the variant, named f. *larga* by Koste (1978) remains uncertain. It may represent an artifact.

130. *Lecane nigeriensis* Segers, 1993
Figs 449-450

Segers 1993 p. 54-55 figs 13a, b

Type locality and types
Littoral of Lake Iyi-Efi, Imo State, Nigeria. Holotype in MRAC, paratypes in RUG.

Differential diagnosis
L. nigeriensis resembles *L. lunaris*, but is distinguished by its biconvex ventral head aperture margin, and by the lateral margins of its dorsal plate not reaching the anterior margin. In this respect, the species is much like *L. elsa*, which has separate toes. The lorica of *L. nigeriensis* is relatively long, the toe relatively short, when compared to *L. lunaris*. *L. nigeriensis* has a more elongate lorica, relatively longer toe and shorter pseudoclaws than *L. amazonica*.

Description
Lorica stiff. Dorsal plate anteriorly narrower, medially as wide as ventral plate, smooth. Head aperture margin dorsally nearly straight, ventrally biconvex, antero-lateral corners angulate. Lateral margins of dorsal plate do not reach the anterior margin. Ventral plate longer than wide, transverse fold complete. Lateral margin smooth, nearly parallel. Lateral sulci deep. Foot region broad, coxal plates rounded triangular. Prepedal fold broad, distal margin rounded. Foot pseudosegment simple, not projecting. Toe relatively short, with two short pseudoclaws and accessory claws.

Measurements: DPl. 107-116, DPw. 85-90, VPl. 115-122, VPw. 88-93, Toe l. 40-43, claw l. 9-10.

Distribution
A single record from the type locality only.

131. *Lecane unguitata* (Fadeev, 1925)
Figs 451-452

Synonym: *L. unguitata africana* Koste, 1978

Fadeev 1925 p. 21 plate 1 fig. 7 (*Monostyla unguitata*); Hauer 1938 p. 548-549 figs 71a, b (*M. unguitata*); Ahlstrom 1938 p. 102 plate 7 fig. 5 (*M. unguitata*); Wiszniewski 1954 p. 72 (*Lecane unguitata*); Wulfert 1966 p. 82 figs 38a-e; Kutikova 1970 p. 481 fig. 687; Koste 1978 p. 246 plate 80 figs 6a-f (incl. *L. (M.) unguitata africana* (Wulfert, 1966)); Shiel & Koste 1985 p. 5 figs 2a, b; Koste & Shiel 1990 p. 13 plate 7 fig. 2 (*Monostyla unguitata*).

Differential diagnosis
L. unguitata is characterised by the shape of its head aperture margins, being straight dorsally and having a pair characteristic antero-sublateral projections and a distinct median sinus ventrally. In this, the species resembles *L. stevensae*, *L. blachei* and *L. nwadiaroi*. *L. stevensae* has relatively shorter claws than *L. unguitata*, *L. blachei* and

L. nwadiaroi have incompletely fused toes.

The species is also related to *L. amazonica*, *L. stenroosi* and *L. sylviae*, which differ in the shape of the projections on the ventral head aperture margin.

Description

Lorica stiff, nearly circular. Dorsal plate narrower than ventral plate, smooth. Lateral margins reach anterior end of lorica. Dorsal head aperture margin straight, ventral with clear median sinus, intermediate straight parts and sublateral, rounded triangular projections. Antero-lateral corners angulate or rounded. Ventral plate as wide as long or slightly longer than wide, widest medially, smooth. Transverse fold complete. Lateral margins smooth, strongly curved. Posterior region of ventral plate occasionally with lateral outgrows, these may be asymmetrical. Lateral sulci deep. Foot plate relatively narrow, coxal plates rounded triangular. Prepedal fold broad, distally rounded. Foot pseudosegment not projecting. Toe single, constricted basally then nearly parallel-sided, bearing two long pseudoclaws and accessory claws.

Measurements: DPl. 83-110, DPw. 86-92, VPl. 93-122, VPw. 93-95, toe l. 23-29, claw l. 14-15.

Distribution

The species is common in the subtropical and tropical regions of the Old World and Australia. The single illustrated record of this species from America (Ahlstrom, 1932) is not *L. unguitata*, but probably depicts a *L. stenroosi* with parallel-sided toe, or a related taxon. Koste & José de Paggi (1982) refer to Koste (1972), in which, however, no report is made of an *L. unguitata* from the Neotropical region.

Comments

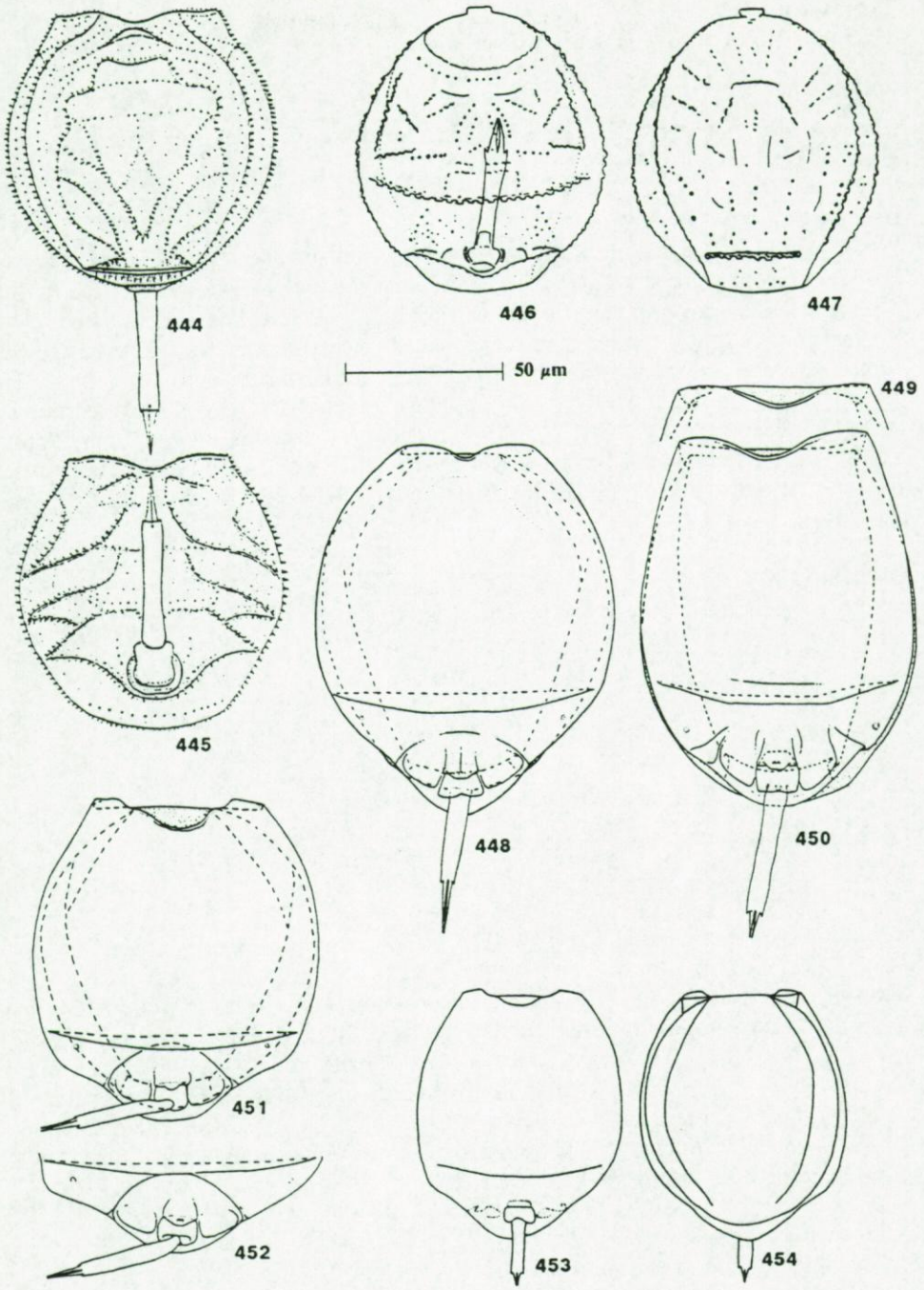
L. unguitata after Shiel & Koste (1985) represents an incompletely contracted specimen. The 'subspecies' *L. unguitata africana*, established by Koste (1978, erroneously contributed to Wulfert, 1966), is an infrasubspecific variant without taxonomic significance, as specimens with left/right asymmetry of postero-lateral margins of the ventral plate (see figure 452), mixing the characters distinguishing between *L. unguitata* and *L. unguitata africana*, can be found.

132. *Lecane stephensae* (Hutchinson, 1931)
Figs 453-454

Hutchinson 1931 p. 566-567 figs 4a, b (*Monostyla stephensae*); Wiszniewski 1954 p. 71 (*Lecane stephensae*).

→

Figs 444-445: L. armata. 444: dorsal view, 445: ventral view.
Figs 446-447: L. gillardi. 446: ventral view, 447: dorsal view.
Fig. 448: L. amazonica, ventral view.
Figs 449-450: L. nigeriensis, ventral view. 449: head aperture.
Figs 451-452: L. unguitata, ventral view. 452: posterior part of lorica and toe.
Figs 453-454: L. stephensae. 453: ventral view, 454: dorsal view.
(444-445: after Koste, 1974; 446-447: after Bērziņš, 1960; 448: Rio Jatapú, Amazonas, Brazil; 449-450: after Segers, 1993; 451-452: Nigeria (Segers *et al.*, 1993a); 453-454: after Hutchinson, 1931).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Type locality
Matsume Lake, near Masiyeni, Mozambique.

Differential diagnosis
L. stephensae is close to *L. unguitata*. The species has a relatively shorter toe and, especially, claw.

Description
Lorica stiff, nearly circular. Dorsal plate narrower than ventral plate, smooth. Dorsal head aperture margin straight, ventral with clear median sinus, intermediate straight parts and sublateral, rounded triangular projections. Antero-lateral corners angulate. Ventral plate slightly longer than wide, widest medially, smooth. Transverse fold complete. Lateral margins smooth, strongly curved. Posterior region of ventral plate asymmetrical. Lateral sulci deep. Foot plate relatively narrow, coxal plates rounded triangular. Prepedal fold broad, distally rounded. Foot pseudosegment not projecting. Toe single, relatively short, bearing short pseudoclaws and accessory claws.

Measurements: Tot. l. 163, DPl. 125, DPw. 103, VPl. 133, VPw. 110, toe l. (incl. claw) 43.

Distribution
A single specimen known.

133. *Lecane stenroosi* (Meissner, 1908)
Figs 455-457

Synonym: *L. bicornis* (Stenroos, 1898) non (Daday, 1897)

M. bicornis after Murray (1913a), Sachse (1914); ?*M. unguitata* after Ahlstrom (1938)

Infrasubspecific taxa: var. *lineata* Wulfert, 1966; var. *californica* Wulfert, 1966

Stenroos 1898 p. 164 plate 2 fig. 26 (*M. bicornis* non Daday, 1897); Meissner 1908 p. 22 plate 1 fig. 8 (*Monostyla stenroosi*); Harring & Myers 1926 p. 394-395 plate 34 figs 1, 2 (*M. stenroosi*); Ahlstrom 1934 p. 264 plate 26 figs 4, 5 (*M. stenroosi*); Wiszniewski 1953 p. 378 (*Lecane stenroosi*); Tarnogradski 1961b p. 60 fig. 72; Wulfert 1966 p. 80 figs 35a-c; Kutikova 1970 p. 474 fig. 669; Koste 1978 p. 247 plate 80 figs 7a-e (incl. f. *lineata*), plate 81 figs 6a, b (f. *californica*); Koste & Shiel 1990 p. 11-12 plate 6 fig. 2 (*Monostyla stenroosi*).

Differential diagnosis
L. stenroosi is close to *L. stephensae*, *L. sylviae* and *L. unguitata*. It is characterised by the shape of the lateral projections on the anterior margin of its ventral plate: these are broad and bear sharp, inwards-directed projections. The species has been confused with *L. cornuta*, in which the head aperture margins are nearly coincident and broadly concave. In *L. stenroosi*, the dorsal head aperture margin is straight, whereas the ventral has the above-cited projections and a median sinus.

Description
Lorica stiff, smooth. Dorsal plate narrower than ventral plate, lateral margins reach anterior end of lorica. Head aperture margin dorsally straight, ventrally with median sinus. Antero-lateral projections variable, terminating in sharp, inwards-directed spines. Ventral plate longer than wide, widest medially, transverse fold complete. Lateral margins smooth, strongly curved. Lateral sulci deep. Foot plate relatively narrow, coxal plates rounded triangular. Prepedal fold broad, distally rounded. Foot pseudosegment normally not projecting, widest distally. Toe single, mostly broadest basally, occasionally nearly parallel-sided. Two separate or, rarely, fused pseudoclaws and accessory claws present.

Measurements: DPl. 90-117, DPw. 83-100, VPl. 98-122, VPw. 85-103, toe l. 35-51, claw l. 10-12.

Distribution
Cosmopolitan, not uncommon. Occurs in fresh or slightly saline waters.

Comments
The toe shape is variable in *L. stenroosi*. It can be nearly parallel-sided (var. *lineata* Wulfert, 1966: fig. 456), or, mostly, be broadest basally, with a more (fig. 455) or less (fig. 457) narrow distal part. The pseudoclaws may be fused or separate.

The identity of the 'var. *californica* Wulfert, 1966' needs reexamination. It most likely represents an artifact.

134. *Lecane sylviae* Segers, 1993
Figs 458-459

Segers 1993 p. 58-59 figs 23a, b.

Type locality and types
Littoral of Lake Iyi-Efi, Imo State, Nigeria. Holotype and paratypes in MRAC, paratypes in RUG.

Differential diagnosis
L. sylviae is distinguished from *L. stenroosi* by the double pair of antero-lateral projections (single in *L. stenroosi*) and by the ornamentation of the lorica.

Description
Lorica stiff. Dorsal plate narrower than ventral plate, ornamented, with spicules on lateral margins. Dorsal head aperture margin straight, ventral with broad median sinus, a sublateral pair of sharp spines and a lateralmost pair of rounded projections. Ventral plate slightly longer than wide, broadest in posterior half, ornamented. Transverse fold complete. Lateral margins smoothly curved. Minute spicules present on lateral margins of dorsal and ventral plates, also scattered in posterior region of ventral plate. Foot plate broad, coxal plates rounded. Prepedal fold broad, rounded distally. Foot pseudosegment trapezoidal, widest distally, not projecting. Toe nearly parallel-sided, with minute terminal fissure. Pseudoclaws and accessory claws present.

Measurements: DPl. 124-129, DPw. 108-119, VPl. 137-144, VPw. 117-126, toe l. 41-48, claw l. 10-13.

Distribution
Known from the type locality, from Owena river Basin, Ondo State, and from Lake Asijene, Oyo State (S.I. Ovie, pers. comm.), Nigeria.

135. *Lecane monostyla* (Daday, 1897)
Figs 13, 460-462

Synonym: *L. spinifera* (Idelson, 1924)

Daday 1897 p. 143 fig. 10 (*Diarthra monostyla*); Harring 1913b p. 390 (*Monostyla monostyla*); Idelson 1924 p. 224 (*Monostyla spinifera*), 1925 p. 72 fig. 1; Harring & Myers 1926 p. 411-412 plate 46 figs 1, 2; Myers 1942 p. 264 (*Lecane monostyla*); Kutikova 1970 p. 463-464 fig. 644, Koste 1978 p. 260-261 plate 84 fig. 13a, b, plate 85 fig. 6a, b; Koste & Shiel 1990 p. 9 plate 4 fig. 1 (*Monostyla monostyla*).

Type locality
New Guinea.

Differential diagnosis
The lateral extensions on the dorsal plate provide an easy diagnosis of the species. It can not be confused with any congener.

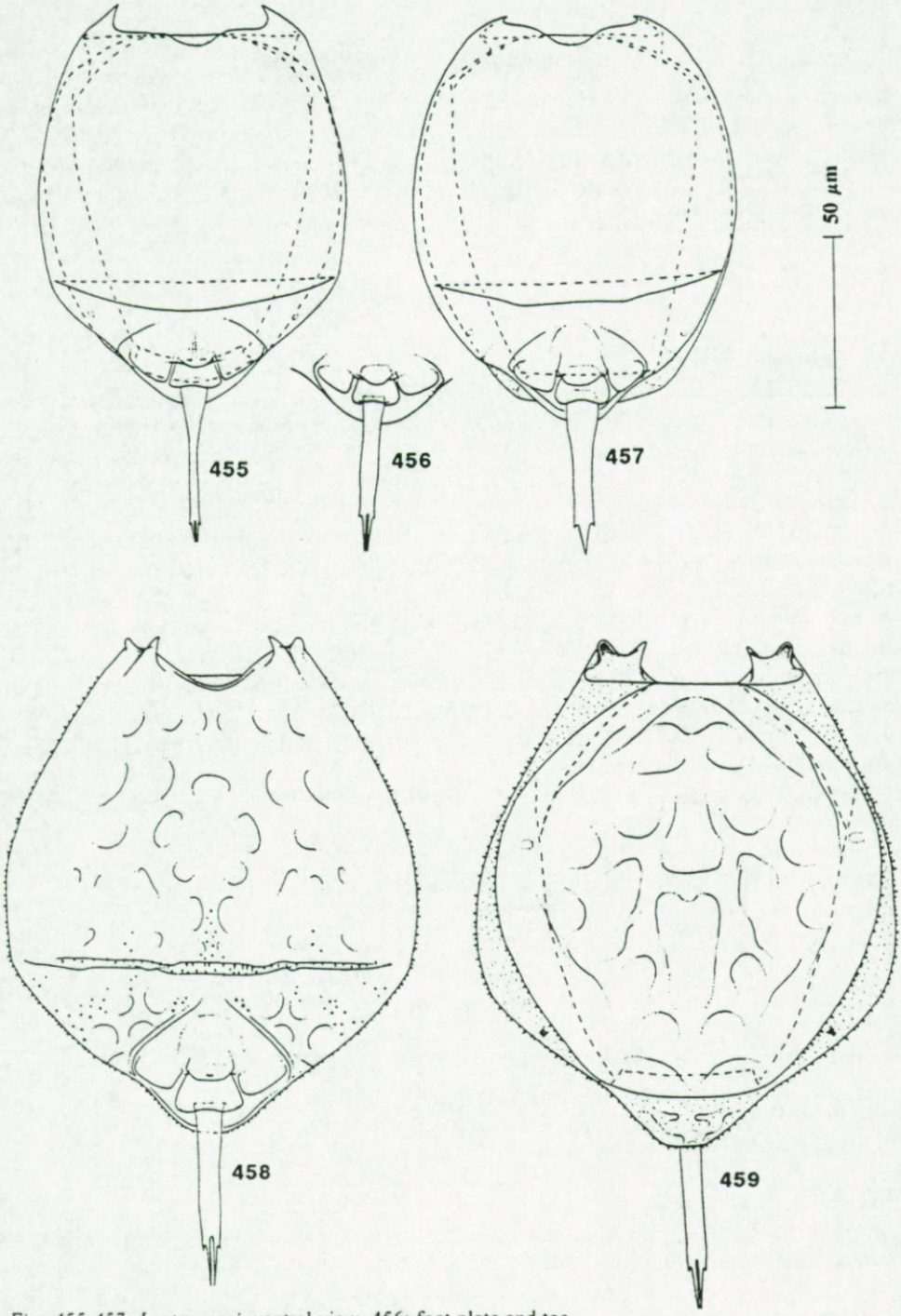
Description
Lorica stiff, smooth or slightly ornamented. Dorsal plate anteriorly narrower, medially wider than ventral plate. Dorsal plate with conspicuous lateral, flexible elongate extensions. Head aperture margins nearly coincident, slightly concave or straight, antero-lateral spines present. Ventral plate slightly longer than wide, with incomplete transverse and longitudinal folds. Lateral margins smooth, straight, nearly parallel-sided. Lateral sulci deep. Foot plate short, with rounded coxal plates. Prepedal fold narrow, elongate, distally with median extension. Foot pseudosegment simple, mostly projecting. Toe single, parallel sided then tapering to point, no claw.

Measurements: DPl. 30-58, DPw. 47 (with extensions 110), VPl. 62-80, VPw. 46-50, toe l. 25-40.

Distribution
L. monostyla is a rare warm-stenotherm, occurring more frequently in (sub)tropical regions.

136. *Lecane pyriformis* (Daday, 1905)
Figs 466-470

Synonyms: *L. pomiformis* Edmondson, 1938
L. paraclosterocerca (Pennak, 1939) Voigt, 1957



Figs 455-457: L. stenroosi, ventral view. 456: foot plate and toe.
Figs 458-459: L. sylviae. 458: ventral view, 459: dorsal view.
(455: Lake Kolleru, India; 456: Nigeria (Segers *et al.*, 1993a); 457: pond between Dali and Lijang, Yunnan, China; 458-459: after Segers, 1993).

L. truncata (Turner, 1892) after Murray (1913a)

Daday 1905 p. 112 plate 7 fig. 16 (*Monostyla pyriformis*); Harring & Myers 1926 p. 409-410 plate 45 figs 1, 2; Hauer 1929 p. 156 figs 13a, b; Edmondson 1936 p. 214 (*Lecane pyriformis*); Edmondson 1938 p. 153 fig. 1 (*L. pomiformis*); Pennac 1939 p. 222-223 (*M. paraclosterocerca*); Voigt 1957 p. 238; Kutikova 1970 p. 464-465 fig. 648; Koste 1978 p. 256 plate 84 figs 1a, b; Koste & Shiel 1990 p. 9 plate 4 fig. 4 (*Monostyla pyriformis*); Segers *et al.*, 1992 p. 188 figs 13a-d.

Type
Paratype in PANS.

Differential diagnosis
This small *Lecane* cannot be confused with any of its congeners, by its dorsal plate being consistently wider than the ventral, and characteristic toe. It resembles most *L. minuta*, which has a split toe.

Description
Lorica stiff. Dorsal plate wider than ventral plate, smooth or weakly ornamented. Head aperture margins coincident, straight or slightly convex, antero-lateral corners mostly rounded, occasionally angulate. Ventral plate slightly longer than wide, with an incomplete transverse and longitudinal folds, smooth. Lateral margins smooth or irregularly undulate, slightly curved or nearly straight. Lateral sulci shallow, more pronounced in posterior part. Foot plate broad, rounded posteriorly, coxal plates rounded. Prepedal fold narrow, elongate, distally with median projection. Foot pseudosegment simple, not projecting. Toe single, parallel-sided basally, tapering from medially onwards, no claw.

Measurements: DPl. 45-82, DPw. 46-70, VPl. 50-79, VPw. 38-62, toe l. 25-39.

Distribution
L. pyriformis is a common, cosmopolitan species.

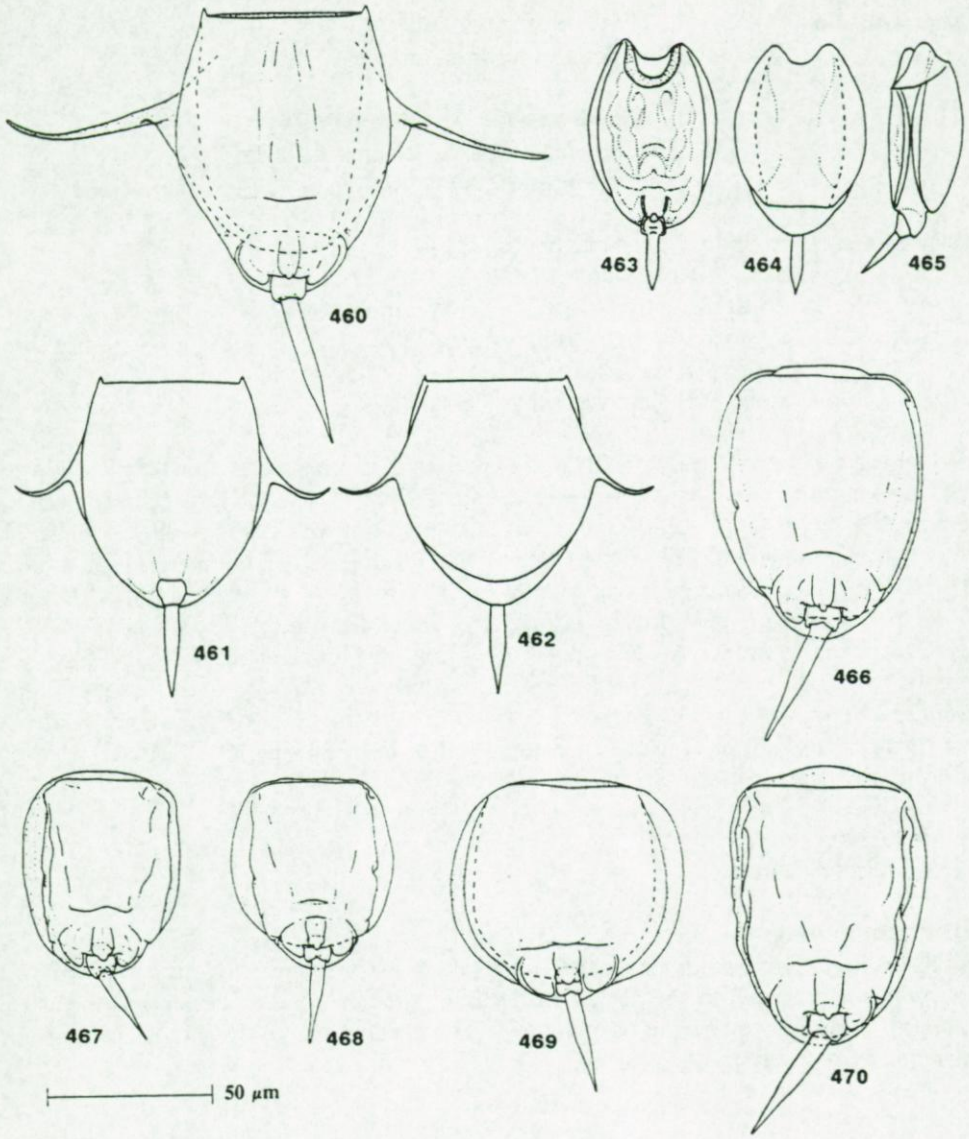
137. *Lecane pawlowskii* Wulfert, 1966
Figs 463-465

Wulfert 1966 p. 77 fig. 19a-c; Koste 1978 p. 258 plate 84 figs 7a-c.

Type locality
Prata-pura Reservoir, India.

Differential diagnosis
L. pawlowskii differs from *L. hamata* by its U-shaped ventral head aperture margin, rounded antero-lateral corners, and by the presence of a rough collar.

Description
Lorica stiff, dorsal plate wider than ventral plate, smooth. Head aperture margins strongly concave, ventral U-shaped. Antero-lateral corners rounded. Ventral plate



Figs 460-462: L. monostyla. 460-461: ventral view, 462: dorsal view.
Figs 463-465: L. pawlowskii. 463: ventral view, 464: dorsal view, 465: lateral view.
Figs 466-470: L. pyriformis, ventral view.
(460: Nigeria (Segers *et al.*, 1993a); 461-462: after Harring & Myers, 1926; 463-465: after Wulfert, 1966; 466-468, 470: after Segers *et al.*, 1992; 469: Lake Nicaragua, near Granada, Nicaragua).

elongate, with incomplete transverse and longitudinal folds, ornamented. Lateral margins smooth, slightly curved. Lateral sulci deep. Foot pseudosegment simple, not or scarcely projecting. Prepedal fold narrow, elongate, distally with median projection. Toe single, parallel sided then tapering to point, no claw.

Measurements: DPl. 62, DPw. 54, VPl. 80, VPw. 46, toe l. 24.

Distribution
A single record from the type locality in India only.

138. *Lecane closterocerca* (Schmarda, 1859)
Figs 10, 471-477

Synonyms: *L. cornuta* f. *anglica* (Bryce, 1924)
L. eichsfeldica (Künne, 1926)
L. brodskii (Muraveisky, 1937) Wiszniewski, 1954
L. latvica (Bērziņš, 1943) Voigt, 1957
L. wulferti Hauer, 1956
L. closterocerca amazonica Koste, 1978

Schmarda 1859 p. 59 plate 14 fig. 125 (*Monostyla closterocerca*); Murray 1913a p. 357-358 plate 15 figs 39a, b; Jakubski 1914 p. 32 plate 1 fig. 1; Harring 1914 p. 548; Bryce 1924 p. 98 (*M. cornuta* f. *anglica*); Harring & Myers 1926 p. 408-409 plate 44 figs 5, 6; Künne 1926 p. 235 fig. 1 (*Monostyla eichsfeldica*); Edmondson 1935 p. 302 (*Lecane closterocerca*); Muraveisky 1937 p. 13 fig. 8 (*Monostyla brodskii*); Bērziņš 1943 p. 237 figs 20-22 (*Monostyla latvica*); Hauer 1956 p. 302-303 figs 18a, b (*L. (M.) wulferti*); Wiszniewski 1954 p. 63, 64; Voigt 1957 p. 238; Kutikova 1970 p. 465 fig. 649 (*L. (M.) brodskii*); p. 466 fig. 650; fig. 651 (*L. (M.) latvica*); Koste 1978 p. 256-257 plate 84 figs 2a-f, 4a, b, 5a-c, 6a, b, plate 85 figs 2a-d (incl. f. *wulferti*, *L. closterocerca amazonica*); José de Paggi 1989 p. 231-232 figs 10-13, Koste & Shiel 1990 p. 4-7 plate 1 fig. 6 (*Monostyla closterocerca*).

Type locality
Near Quito, Equador.

Differential diagnosis
The species is unmistakable by the shape of its toe and lorica. Confusion with *L. cornuta* has occurred in the past, but the latter species is much larger and is easily recognised by its toe bearing pseudoclaws. The species can be distinguished from *L. arcuata* by its more rounded lorica.

Description
Lorica stiff, smooth or slightly ornamented. Dorsal plate anteriorly narrower, medially wider than ventral plate. Head aperture margins nearly coincident, slightly concave or straight. Antero-lateral corners angulate. Lateral edges of dorsal plate do not reach anterior edge. Ventral plate longer than wide, with incomplete transverse and weak longitudinal folds. Lateral margins smooth, slightly curved. Lateral sulci deep. Foot plate short, with rounded coxal plates. Prepedal fold narrow, elongate, posterior margin with median projection. Foot pseudosegment simple, not or distinctly projecting. Toe single, parallel-sided then tapering to point, no claw.
Measurements: DPl. 54-85, DPw. 53-73, VPl. 57-82, VPw. 44-60, toe l. 21-40.

Distribution
Cosmopolitan, one of the commonest species of the genus.

Note
Lecane symoensi De Ridder, 1981 (Figure 483), known only from a lake north of Lubumbashi, Zaire, is reported to differ from *L. closterocerca* by having a smooth lorica bearing two (?) transverse folds on the ventral plate, a nearly circular lorica, a straight or slightly convex dorsal head aperture margin and by being larger. The species differs from *L. cornuta* by having a toe without claws.

Measurements: Tot. l. 145-157, DPl. 105-115, DPw. 105-115, VPl. 105-115, VPw. 100-112, toe l. 40-45.

139. *Lecane arcuata* (Bryce, 1891)
Figs 478-481

Synonym: *L. piepelsi* De Smet & Bafort, 1990a (n. syn.)

non *L. arcuata* after Pax & Wulfert (1941), Wulfert (1966), De Smet & Bafort (1990b)

Bryce 1891 p. 206, text fig. (*Monostyla arcuata*); Murray 1913a p. 360 plate 15 figs 42a, b; Harring & Myers 1926 p. 412-413 plate 47 figs 3, 4; Wiszniewski 1953 (*Lecane arcuata*); De Ridder 1969 p. 170 fig. 16; Kutikova 1970 p. 466 fig. 645; Koste 1978 p. 257 plate 84 figs 3a, b; De Ridder 1981 p. 80-81 fig. 2; Koste & Shiel 1990 p. 4 plate 1 fig. 2 (*Monostyla arcuata*); De Smet & Bafort 1990a p. 258 plate 1 fig. 5 (*L. piepelsi*); De Smet 1993 p. 11-12 fig. 7 (*L. piepelsi*).

Type locality
Epping forest, U.K.

Differential diagnosis
L. arcuata is frequently confused with *L. hamata*. The species is characterised by the shape of its dorsal head aperture margin being more or less straight, the ventral being biconvex. *L. arcuata* is generally smaller and less elongate than *L. hamata*. The bilateral constriction in the anterior region of the ventral plate, reported by Hauer (1924) to distinguish *L. hamata* and *L. arcuata*, can be present or absent in both *L. hamata* and *L. arcuata*, and is not a reliable characteristic.

Description
Lorica stiff. Dorsal plate anteriorly narrower, medially wider than ventral. Head aperture margins nearly coincident, dorsally straight, slightly concave or convex, ventrally broadly sinuate. Antero-lateral corners angulate. Ventral plate elongate, with incomplete transverse, and longitudinal folds. Lateral margins straight or curved, irregularly undulate. Bilateral constriction in anterior part of ventral plate present. Lateral sulci shallow. Foot plate short, with rounded coxal plates. Prepedal fold narrow, elongate, posteriorly with median projection. Foot pseudosegment simple, not projecting. Toe single, parallel-sided then tapering to point, no claw.

Measurements: DPl. 45-69, DPw. 49-63, VPl. 60-73, VPw. 40-50, toe l. 23-28.

Distribution
L. arcuata is a common, cosmopolitic species. It is, however, more frequent in temperate regions. The species lives between filamentous algae or submerged mosses, and can be found in even the smallest puddle.

140. *Lecane opias* (Harring & Myers, 1926)
Figure 482

Harring & Myers 1926 p. 411 plate 45 figs 5, 6 (*Monostyla opias*); Myers 1942 p. 264 (*Lecane opias*); Voigt 1957 p. 229 plate 44 fig. 12; Kutikova 1970 p. 465 fig. 646; Koste 1978 p. 257-258 plate 84 figs 8a, b; Koste & Shiel 1990 p. 9 plate 4 fig. 2 (*Monostyla opias*).

Type locality
Hyattsville, near Washington, D.C.; Oneida County, Wisconsin, U.S.A.

Differential diagnosis
L. opias is closest to *L. monostyla*, but has no lateral projections on its dorsal plate. Its antero-lateral spines distinguish the species from *L. pyriformis* and *L. arcuata*.

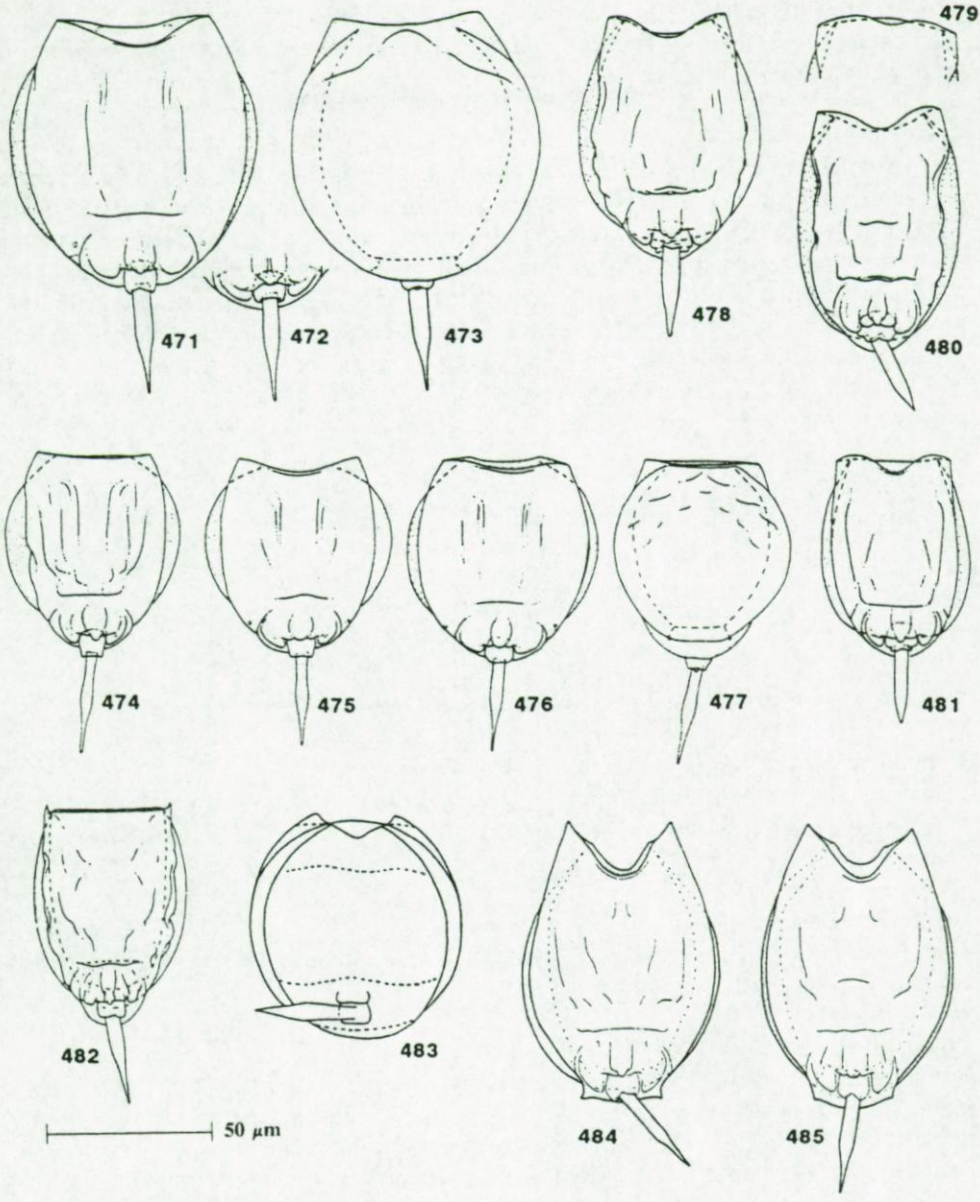
Description
Lorica stiff, smooth. Dorsal plate anteriorly narrower, medially wider than ventral plate. Head aperture margins nearly coincident, straight, antero-lateral spines present. Ventral plate longer than wide, with incomplete transverse and longitudinal folds. Lateral margins smooth, straight, nearly parallel or irregularly folded. Lateral sulci shallow. Foot plate short, with rounded coxal plates. Prepedal fold narrow, elongate, distally with median projection. Foot pseudosegment simple, non-projecting. Toe single, tapering to point, no claw.
Measurements: DPl. 59-66, DPw. 54-60, VPl. 67-99, VPw. 42-55, toe l. 26-30.

Distribution
Presumably cosmopolitan. The species is a cold-stenotherm and acidophil.

141. *Lecane batillifer* (Murray, 1913b)
Figs 484-485

Murray 1913b p. 458 plate 19 figs 2a, b (*Monostyla batillifer*); Harring & Myers 1926 p. 415-416 plate 46 figs 3, 4; Wiszniewski 1954 p. 62 (*L. batillifer*); Wang 1961 p. 144-145 figs 127a, b (*Monostyla batillifer*); Koste & Shiel 1990 p. 4 plate 1 fig. 3 (*Monostyla batillifer*).

Type locality
Pool near Sidney, Australia.



Figs 471-477: L. closterocerca. 471-472, 474-476: ventral view, 473, 477: dorsal view. 472: foot plate and toe.
Figs 478-481: L. arcuata, ventral view.
Fig. 482: L. opias, ventral view.
Fig. 483: L. symoensi, ventral view.
Figs 484-485: L. batillifer, ventral view.
(471-473: Turkey (Segers *et al.*, 1992); 474-477, 481: Nigeria (Segers *et al.*, 1993a); 478: tap water, Gent, Belgium; 479-480, 482: 'Leiemeersen', Oostkamp, Belgium; 483 after De Ridder, 1981; 484-485: Khon Kaen University campus, Khon Kaen, Thailand, leg. L. Sanoamuang).

Differential diagnosis
The species resembles *L. hamata*. It differs by the presence of a peculiar posterior projection of the foot plate.

Description
Lorica stiff. Dorsal plate smooth, anteriorly narrower, medially wider than ventral plate. Lateral sulci shallow. Head aperture margins strongly concave, ventrally deeper than dorsally. Ventral plate ovoid, constricted in anterior region, with incomplete transverse, and longitudinal folds. Foot plate simple, posterior edge undulate with pair of lateral, sharp cusps. Coxal plates rounded. Prepedal fold elongate, narrow, posteriorly with median projection. Foot pseudosegment simple, not projecting. Toe single, parallel-sided then tapering to point, no claws.

Measurements: DPl. 70-85, DPw. 55-59, VPl. 80-95, VPw. 45-54, width of posterior projection 22-25, toe l. 30-33.

Distribution
Known from Australia, China and Thailand. The species is rare.

142. *Lecane marchantaria* Koste & Robertson, 1983
Figure 505

Koste & Robertson 1983 p. 233-234 figs 7a-d, Koste 1988b p. 315 fig. 7.

Type locality and types
Lago Camaleão, Ilha de Marchantaria, Brazil. Holotype and paratypes in the INPA, to be considered lost due to bad conservation of slides (Dos Santos-Silva, pers. comm.)

Differential diagnosis
L. marchantaria can easily be confused with *L. hamata*, but it is larger and has nearly coincident, broadly U-shaped head aperture margins.

Description
Lorica stiff, dorsal plate anteriorly nearly as wide as, medially wider than ventral plate, smooth. Head aperture margins nearly coincident, strongly concave, anterolateral corners sharp. Ventral plate elongate, smooth, transverse fold incomplete. Lateral margins smooth, curved. Lateral sulci deep. Foot plate with rounded triangular coxal plates and simple, non-projecting foot pseudosegment. Prepedal fold narrow, elongate, distally with median projection. Toe single, parallel sided then tapering to point, no claw.

Measurements: Tot. l. 133-148, DPl. 90-95, DPw. 70-72, VPl. 95-100, VPw. 50-64, toe l. 42-47.

Distribution
Restricted to South America: records are from Brazil (Amazon and Pantanal regions), and Peru.

143. *Lecane hamata* (Stokes, 1896)
Figs 486-501

Synonyms: *L. sinuata* (Hauer, 1938) Voigt, 1957
L. fernandoi Chengalath & Mulamoottil, 1974
L. arcuata f. *magna* Koste, 1978
L. hamata victoriensis Koste & Shiel, 1980

L. arcuata after Pax & Wulfert (1941), Wulfert (1966), De Smet & Bafort (1990b).
L. decipiens after Chengalath & Fernando (1973), Chengalath & Mulamoottil (1974), Mamaril & Fernando (1978), Nogrady (1962), Sharma (1978a), Sarma & Ghimire (1990).
L. cf. *decipiens* after Pejler (1962)

Infrasubspecific taxon: *L. hamata* f. *arcuata* Koste, 1978

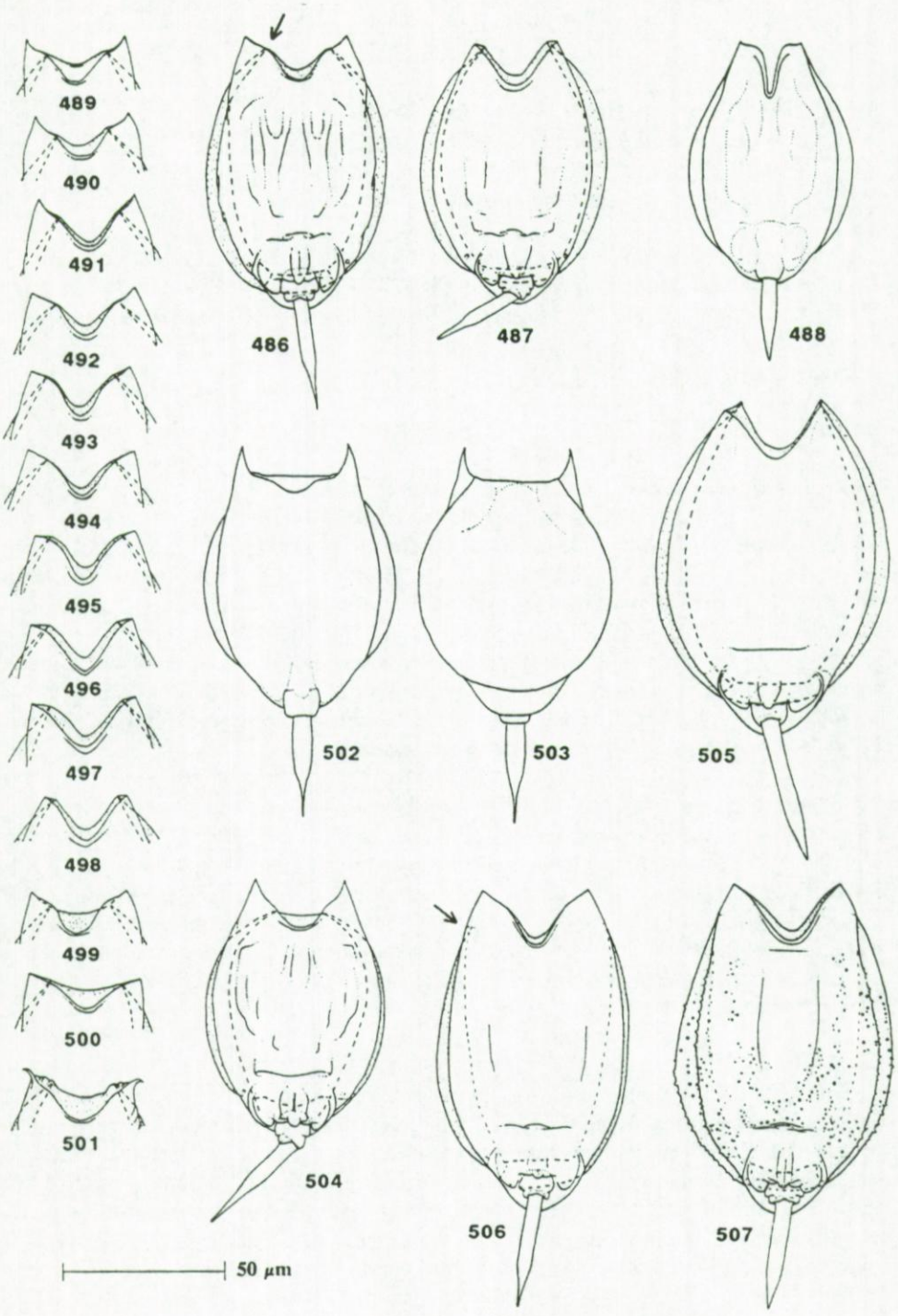
Stokes 1896 p. 21 figs 6-8 (*Monostyla hamata*); Murray 1913a p. 359-360 plate 15 figs 41a-d; Harring & Myers 1926 p. 414-415 plate 47 figs 1, 2; Myers 1937 p. 3 (*Lecane hamata*); Hauer 1938 p. 545-546 figs 67a, b (*Monostyla sinuata*); Voigt 1957 p. 230 plate 41 fig. 2, plate 43 fig. 22; p. 238 (*L. sinuata*); Kutikova 1970 p. 466-468 fig. 647; Chengalath & Mulamoottil 1974 p. 954 figs 62, 63 (*L. (M.) fernandoi*); Koste 1978 p. 257 (*L. arcuata* f. *magna*); p. 258-259 plate 84 figs 10a-c, plate 85 figs 5a-c, plate 84 fig. 11 (var. *sinuata*); plate 85 figs 4a-b (*L. hamata fernandoi*); 5a, b (f. *arcuata*); c; Koste & Shiel 1990 p. 8 plate 3 figs 2a (*Monostyla hamata*), b (*M. hamata victoriensis*); p. 11 plate 6 fig. 1 (*M. sinuata*); De Smet & Bafort 1990b p. 127-128 plate 1 figs 13a-c (*L. arcuata* var. *sinuata*).

Differential diagnosis
The species can be confused with *L. arcuata* and *L. decipiens*. It differs from *L. arcuata* by its strongly concave ventral and dorsal anterior margins, and sharp antero-lateral projections. Its relatively more elongate ventral plate and larger size can help in the distinction of the two taxa. From *L. decipiens*, the species is easily distinguished by the lateral margins of its dorsal plate reaching the head aperture.

From *L. thienemanni*, *L. pawlowskii* and *L. marchantaria*, the species differs by its different head aperture shape.

Description
Lorica stiff, dorsal plate anteriorly narrower, medially wider than ventral plate, smooth or ornamented. Head aperture variable and easily deformed, margins coincident or dorsal margin extending beyond ventral margin, mostly strongly concave. Antero-lateral corners sharp. Ventral plate elongate, with incomplete transverse and weak longitudinal folds, mostly ornamented. Lateral margins smooth, slightly curved, anterior notches present or absent. Lateral sulci shallow. Foot plate with rounded triangular coxal plates, and simple, non-projecting foot pseudosegment. Prepedal fold narrow, elongate, distally with median projection. Toe single, parallel sided then tapering to point, no claw.

Measurements: DPl. 61-88, DPw. 52-66, VPl. 77-98, VPw. 40-60, toe l. 26-38.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Distribution
A common eurytopic, cosmopolitan species.

Comments
The species has highly variable and easily deformed head aperture margins (Figs 488-501). Both *L. sinuata* and *L. hamata victoriensis* appear to have been diagnosed from such specimens. Similar ones can be encountered occasionally. *L. fernandoi* also concerns an artifact, with bilaterally contracted lorica.

144. *Lecane thienemanni* (Hauer, 1938)
Figs 502-504

Hauer 1938 p. 548 figs 78a, b (*Monostyla thienemanni*); Wiszniewski 1954 p. 72 (*Lecane thienemanni*); Koste 1978 p. 259 plate 84 figs 14a-d (*L. (M.) hamata* var. *thienemanni*), Sharma 1979 p. 58 figs 17, 18; Koste 1988a p. 123 fig. 27.

Type locality and type
Near Balige and region of Singkarak, Sumatra; spring near Sindanglaja reservoir, botanical garden of Buitenzorg, Ranu Lamongan, Java. No type designated, apparent syntype in RUG.

Differential diagnosis
L. thienemanni and *L. hamata* can be distinguished only by carefully comparing the shape of the head aperture (larger and sharper antero-lateral projections in *L. thienemanni* and narrower anterior margin of dorsal plate), the shape of the ventral plate (nearly parallel-sided, lateral margins nearly straight in *L. thienemanni*, curved in *L. hamata*), and the foot pseudosegment (mostly projecting in *L. thienemanni*).

Description
Lorica stiff, dorsal plate anteriorly narrower, medially wider than ventral plate, smooth. Head aperture margin dorsally nearly straight, ventrally concave, antero-lateral projections prominent. Ventral plate elongate, with incomplete transverse and weak longitudinal folds, mostly ornamented. Lateral margins smooth, slightly curved. Lateral sulci deep. Foot plate with rounded triangular coxal plates and, mostly, projecting foot pseudosegment. Prepedal fold narrow, elongate, distally with median projection. Toe single, parallel sided then tapering to point, no claw.
Measurements: DPl. 64-70, DPw. 62-64, VPl. 76-123, VPw. 46-55, Toe l. 32-38.

←
Figs 486-501: L. hamata, ventral view. 489-501: head aperture.
Figs 502-504: L. thienemanni. 502, 504: ventral view, 503: dorsal view.
Fig. 505: L. marchantaria, ventral view.
Fig. 506: L. decipiens, ventral view.
Fig. 507: L. serrata, ventral view.
(486-487, 489-501, 504: Nigeria (Segers *et al.*, 1993a); 488: after Hauer, 1938 (sub. *Monostyla sinuata*); 502-503: after Hauer, 1938; 505, 506: Rio Abobral, Pantanal region, Brazil; 507: after Segers & De Meester, 1994).

Distribution
The species is rare, but has been recorded from several localities in tropical and subtropical regions of Africa, the Americas, Asia and Australia.

145. *Lecane decipiens* (Murray, 1913a)
Figs 9, 21, 506

non *L. decipiens* after Chengalath & Fernando (1973), Chengalath & Mulamoottil (1974), Mamaril & Fernando (1978), Nogrady (1962), Sharma (1978), Sarma & Ghimire (1990).
non *L.* cf. *decipiens* after Pejler (1962)

Murray 1913a p. 360-361 plate 15 figs 43a, c (*Monostyla decipiens*); Harring & Myers 1926 p. 413-414 plate 47 figs 5, 6; Wiszniewski 1954 p. 64 (*Lecane decipiens*); Kutikova 1970 p. 468 fig. 653; Koste 1978 p. 260 plate 84 figs 9a, b; Koste & Shiel 1990 p. 7 plate 2 fig. 4 (*Monostyla decipiens*).

Type locality
Placa Republica, Rio de Janeiro, Brazil.

Differential diagnosis
L. decipiens has often been confused with *L. hamata*. It is characterised by the lateral margins of its dorsal plate ending in small but distinct transverse folds, and not reaching the head aperture. *L. decipiens* has coincident head aperture margins, those of *L. hamata* are variable.

The species differs from *L. serrata* by its smooth lorica.

Description
Lorica stiff, smooth. Lateral margins of dorsal plate do not reach the head aperture. Head aperture margins coincident, strongly convex. Antero-lateral corners sharp. Ventral plate elongate, with incomplete transverse and weak longitudinal folds. Lateral margins smooth, slightly curved. Lateral sulci deep. Foot plate with rounded triangular coxal plates, prepedal fold narrow, elongate, posteriorly with median projection. Foot pseudosegment simple, not projecting. Toe single, parallel sided then tapering to point, no claw.

Measurements: DPl. 75-116, DPw. 60-98, VPl. 90-128, VPw. 50-78, toe l. 25-48.

Distribution
L. decipiens appears to be relatively common in South and Central America. The species has also been found in collections from Algeria (leg. B. Samraoui) and Nigeria.

Comments
See under *L. serrata*.

146. *Lecane serrata* (Hauer, 1933)
Figure 507

Infrasubspecific taxon: f. *echinata* Koste, 1988

Hauer *in* Thienemann 1933 p. 8 fig. 2 (*Monostyla serrata*); Hauer 1938 p. 544-545 figs 66a, b; Wiszniewski 1954 p. 64 (*Lecane decipiens serrata*); Koste 1988a p. 122 figs 22a, b (incl. f. *echinata*).

Type locality
In phytotelmata (*Nepenthes* sp. and *Hingibar neglectum*), Sumatra.

Differential diagnosis
The species differs from *L. decipiens* by having a pustulate rather than smooth lorica.

Description
Lorica stiff, covered with minute pustules, especially in the posterior part. Lateral margins of dorsal plate do not reach the head aperture. Head aperture margins coincident, strongly convex. Antero-lateral corners sharp. Ventral plate elongate, with incomplete transverse and weak longitudinal folds. Lateral margins smooth, slightly curved. Lateral sulci deep. Foot plate with rounded triangular coxal plates, prepedal fold narrow, elongate, posteriorly with median projection. Foot pseudosegment simple, not projecting. Toe single, parallel sided then tapering to point, no claw.
Measurements: DPl. 85-86, DPw. 65, VPl. 88-99, VPw. 51-55, toe l. 34-36.

Distribution
Known from Sumatra, Borneo, Papua New Guinea and Nigeria.

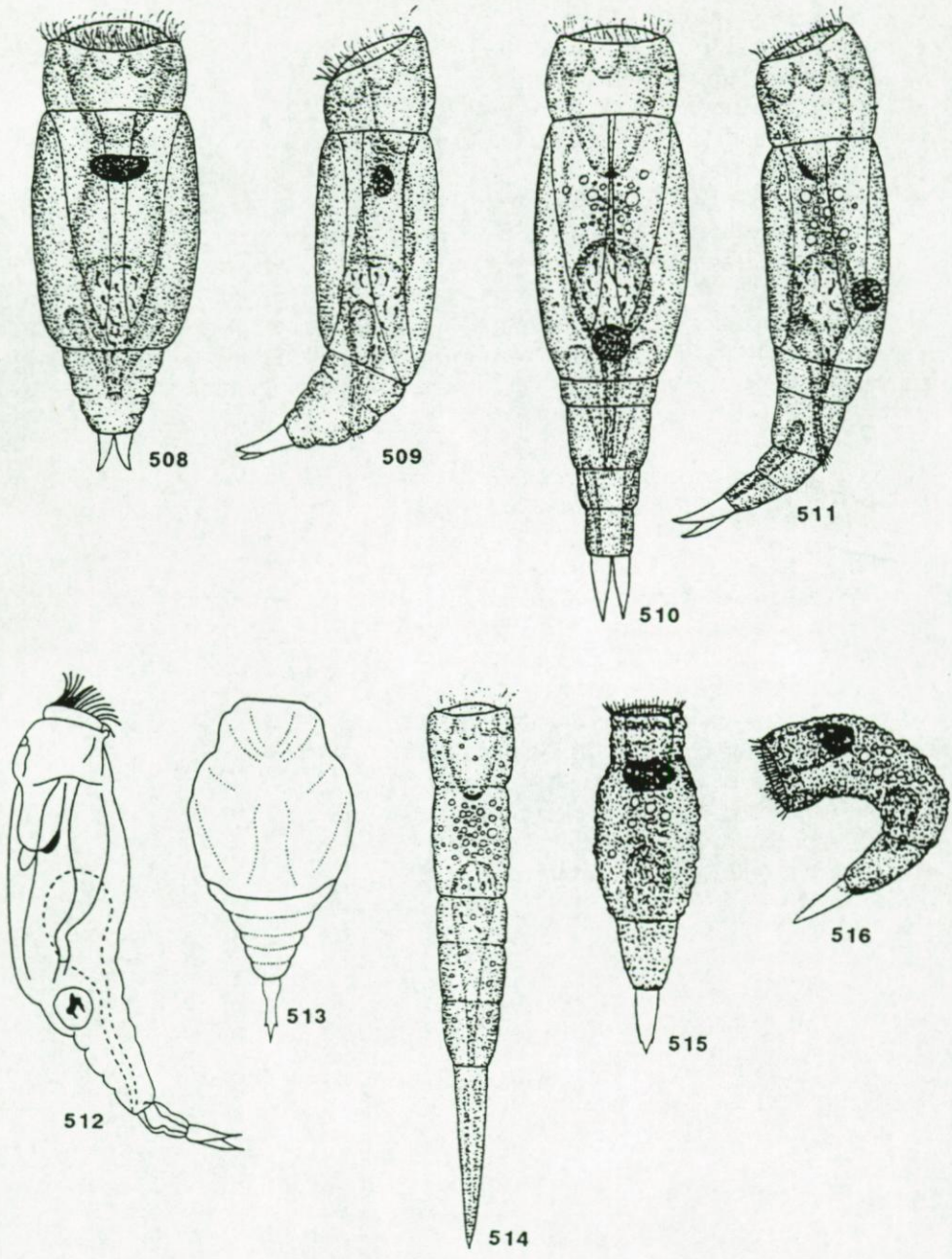
Comments
The relation between *L. decipiens* and *L. serrata* remains unclear. Further research may confirm the suggestion by Wiszniewski (1954), that the two are synonyms.

List of *species inquirendae*

The original descriptions of the following *species inquirendae* do not permit any conclusion nor a reliable diagnosis to be formulated, or were based on badly contracted animals.

- *L. acinaces* (Mola, 1913) Mola, 1930
- *L. affinis* (Levander, 1894) Mola, 1930
- *L. althausi* Rudescu, 1960 (compare with *L. clara* (Bryce)?)
- *L. asthena* Harring & Myers, 1926 (compare with *L. pusilla* Harring)
- *L. balatonica* (Varga, 1938) (compare with *L. psammophila* (Wiszniewski))
- *L. bidentata* Dhanapathi, 1976a
- *L. brundini* Thomasson, 1959
- *L. carinata* (Jakubski, 1912) Harring, 1913a
- *L. carpatica* Rudescu, 1960

- *L. cochlearis* (Murray, 1913a) Voigt, 1957 (see Harring & Myers 1926 p. 383: 'a very doubtful species').
- *L. cupha* (Gosse, 1887)
- *L. dentiserrata* (Mola, 1913) Voigt, 1957
- *L. diomis* (Gosse, 1887b) Mola, 1928
- *L. diophthalma* (Iroso, 1910)
- *L. dorsicornuta* (Van Oye, 1926) Wiszniewski, 1954
- *L. elliptoides* (Rodewald, 1937) Voigt, 1957
- *L. falcata* (Murray, 1913c) Voigt, 1957
- *L. gissensis* (Eckstein, 1883) Harring, 1913a
- *L. gossei* (Lord, 1890) Voigt, 1957
- *L. gracilis* (Sachse, 1915)
- *L. hospes* Donner, 1951 (incompletely contracted specimen)
- *L. hudsoni* (Lord, 1890) Voigt, 1957
- *L. hummelincki* De Ridder, 1977
- *L. imbricata* Carlin, 1939 (probably an incompletely contracted specimen: the lorica bears what appears to be an irregular pattern of folds, similar that of to *L. venusta*)
- *L. kahouteki* Chengalath *et al.*, 1974 (incompletely contracted *L. hastata*?)
- *L. korchelti* (Mola, 1913) Mola, 1930
- *L. lankae* Chengalath *et al.*, 1974 (compare with *L. rhenana* Hauer)
- *L. latifrons* (Gosse, 1887b) Remane, 1932
- *L. lordii* (Gosse, 1886) Voigt, 1957
- *L. macrognatha* (Schmarda, 1859) Voigt, 1957
- *L. marlieri* Gillard, 1967 (incompletely contracted specimen)
- *L. matsaluensis* Riikoja, 1933
- *L. mawsoni* Russell, 1958a (Holotype in Canterbury Museum, Christchurch, New Zealand; examined: unrecognisable artifact)
- *L. minnesotensis* (Herrick, 1885)
- *L. mollis* (Gosse, 1887b)
- *L. muscicola* (Bryce, 1891) Harring, 1913a
- *L. myriophilli* (Varga, 1945) Voigt, 1957
- *L. oophthalma* (Schmarda, 1859) Voigt, 1957
- *L. ovata* (Forbes, 1893) Voigt, 1957
- *L. pauliana* Bērziņš, 1960
- *L. piovanellii* Bartoš, 1957
- *L. plesiaides* Chengalath & Fernando, 1973
- *L. prehensor* (Gosse, 1887)
- *L. rusticola* (Gosse, 1886) Harring, 1913a
- *L. sibina* Harring, 1914: see comments under *L. ungulata*.
- *L. similis* Russell, 1958b (Holotype in Canterbury Museum, Christchurch, New Zealand; examined. Description does not correspond with holotype: toes not fused basally, with pseudoclaw. Holotype specimen is an empty lorica).
- *L. sinuosa* Nogrady, 1957
- *L. spenceri* (Shephard, 1892)
- *L. striata* (Gosse, 1887a) Voigt, 1957
- *L. sulcata* (Gosse, 1886) Harring, 1913a



Figs 508-516: Lecane spp., males. 508-509: *L. clara*, 510-511: *L. levistyla*, 512: *L. luna*, 513: *L. quadridentata*, 514: *L. psammophila*, 515-516: *L. perpusilla*.
(508-511, 514: after Wiszniewski, 1934a; 512: after de Beauchamp, 1965; 513: after Harring & Myers, 1926; 515-516: after Wiszniewski, 1936).

- *L. terracianoi* (Mola, 1913) Mola, 1930
- *L. testudinea* (Mola, 1913) Voigt, 1957
- *L. truncata* (Turner, 1892)
- *L. tuxeni* De Ridder, 1970
- *L. ungulata* (Mola, 1913) Voigt, 1957 non (Gosse)
- *L. vandenbrandei* (Gillard, 1957)
- *L. vanmeeli* De Ridder, 1960
- *L. weberi* (Mola, 1913) Mola, 1930
- *L. weissei* (Eichwald, 1847)

No information other than a citation in the works listed could be found of the following names. Only the citation of *L. romeroi* by Selga (1952) was accompanied by a reference to a paper containing its description. This paper could not be traced. Apart of this species, all are probably *nomina nuda*.

Xenomonostyla after Sudzuki *et al.* (1992)
Heteromonostyla after Sudzuki *et al.* (1992)

- *L. astia* after Koste & Robertson (1990)
- *L. branchicola* (Piovanelli, 1903) Harring, 1913a: see Bartoš, 1957
- *L. clypta* Harring & Myers, 1926 after Voigt (1957)
- *L. flexiloides* Wulfert after Bērziņš (1967)
- *L. kawamurai* Yamamoto after Yamamoto (1960)
- *L. monostyla bryocola* after Sudzuki (1971)
- *L. nodosa elongata* after Sudzuki *et al.* (1992)
- *L. nymphae* (sub. *Monostyla*) after Sudzuki (1989)
- *L. quintata* (sub. *Monostyla*) after Sudzuki *et al.* (1992)
- *L. romeroi* Pardo, 1931: listed in Selga (1952)
- *L. tenuiseta spina* after Sudzuki *et al.* (1992)

ADDENDUM

After the termination of this work, the following species became known:

147. *Lecane thailandensis* Segers & Sanoamuang, 1994
Figs 517-525

L. hornemanni after Wang (1961).

Segers & Sanoamuang 1994 p. 43-46 figs 4a-i.

Type locality and types
Nam Pung reservoir, Sakon Nakhon province, Thailand. Holotype and one paratype in the KBIN, paratypes in RUG and personal collection of L. Sanoamuang.

Differential diagnosis
L. thailandensis is close to *L. latissima*. The two differ by the lorica surface, being strongly pustulated in *L. thailandensis*, and smooth in *L. latissima*. Differences in ecology and distribution exist: *L. latissima* is a well-known cold-stenotherm, *L. thailandensis* is probably an Oriental, warm water species.

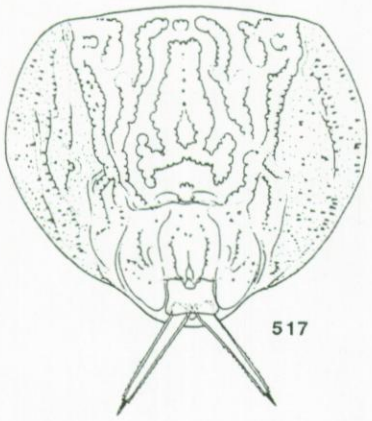
Both *L. thailandensis* and *L. latissima* are distinguished from the related *L. hornemanni* by their toes bearing claws, from *L. ruttneri* by their larger size and dorsal plate being wider than long, and from *L. abanica* by their larger size and rounded lorica.

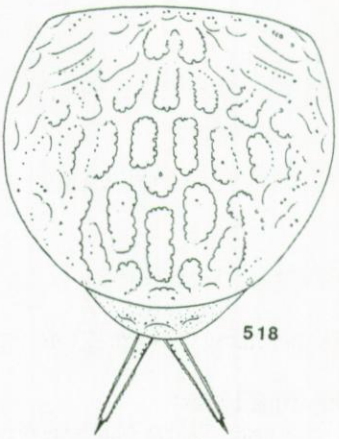
Description
Lorica relatively stiff. Dorsal plate wider than ventral plate, armed with rows of spines and bearing ornamental folds. Head aperture margins nearly coincident, straight or slightly convex, with rounded antero-lateral corners. Ventral plate slightly longer than wide, with incomplete transverse and longitudinal folds, ornamented with rows of spines. No lateral sulci. Foot plate broad, coxal plates rounded triangular. Prepedal fold relatively broad, elongate, distally with median projection. Foot pseudosegment constricted medially, not projecting. Toes long, slightly tapering to distally, with small spicules laterally and dorsally. Claws incompletely separated, bent dorsad.

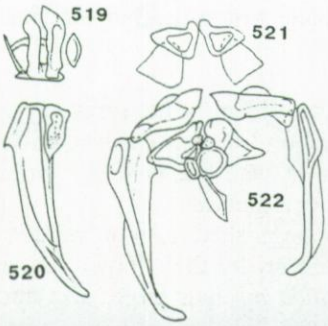
Measurements: DPl. 85-95, DPw. 95-110, VPl. 98-105, VPw. 61-85, toe l. 33-38, claw l. 5-6.

Distribution
L. thailandensis is known from two localities in Thailand, and from China. The species is probably warm-stenotherm and Oriental.

Comments
The trophi morphology of *L. thailandensis* was compared with that of its closest relative, *L. latissima*. A number of apparent differences adding to the separation of the two taxa was observed: the rami are more pronouncedly asymmetrical, and the left







50 μm (figs 517, 518)
50 μm (figs 519-522)

bulla ramus more rounded in *L. thailandensis*. Differences in shape of the unci, manubria and preuncinal plates are also present. On the other hand, both species have a single pair of round antero-median projections on the preuncinal plate. This character, not seen in any other species examined, may point at the kinship of both species.

148. *Lecane donyanaensis* Mazuelos & Segers, 1994
Figure 526

Lecane cf. *leontina* after Mazuelos *et al.*, 1993.

Mazuelos & Segers *in* Galindo *et al.* p. 237-238 1994 fig. 2

Type locality and types
Temporary ponds in the Doñana National Park, Spain. Holotype in the Museo Nacional de Ciencias Naturales, Madrid, Spain, paratypes in RUG.

Differential diagnosis
Lecane donyanaensis is close to *L. ungulata*. It is distinguished by its sharp, pointed postero-lateral processi on the foot plate. In *L. ungulata*, the posterior margin of the foot plate is truncate.

L. donyanaensis superficially resembles *L. leontina*. Differences are in the shape of the head aperture margins (both concave in *L. leontina*, dorsal slightly convex in *L. donyanaensis*), their absolute *(L. donyanaensis* is larger than *L. leontina*) and relative dimensions (lorica and toes relatively stout in *L. donyanaensis*), and the length of their pseudoclaws (longer in *L. donyanaensis*).

Description
Lorica stiff. Head aperture margin ventrally concave, dorsally slightly convex, occasionally irregular. Dorsal plate narrower than ventral, with some irregular folds anteriorly, otherwise smooth. Antero-lateral spines present. Ventral plate longer than broad, smooth. Transverse fold incomplete. Lateral margins smooth, slightly curved. Lateral sulci deep. Foot plate broad, posterior margin with a pair of pointed postero-lateral projections and a smoothly curved medial part. Coxal plates rounded triangular. Prepedal fold broad, distally rounded. Foot pseudosegment trapezoidal, not projecting. Toes nearly parallel-sided, with weak basal swelling and occasional local constrictions. Pseudoclaws long, accessory claws present.

Measurements: DPl. 207-250, DPw. 178-204, VPl. 200-278, VPw. 180-232, head aperture w. 119-150, toe l. 60-84, claw l. 25-38.

Comments
The status of *L. donyanaensis* as a separate species relative to *L. ungulata* appears

←
Figs 517-525: L. thailandensis. 517: ventral view, 518: dorsal view, 519: right uncus, anterior view, 520: manubrium, lateral view, 521: preuncinal plates, ventral view, 522: trophi, ventral view, 523: detail of lorica ornamentation, 524: ventral view, 525: toe, lateral view (523-525: SEM photographs. Scale bars: 523, 525: 5μm, 524: 20 μm).
(517-525: after Segers & Sanoamuang, 1994).

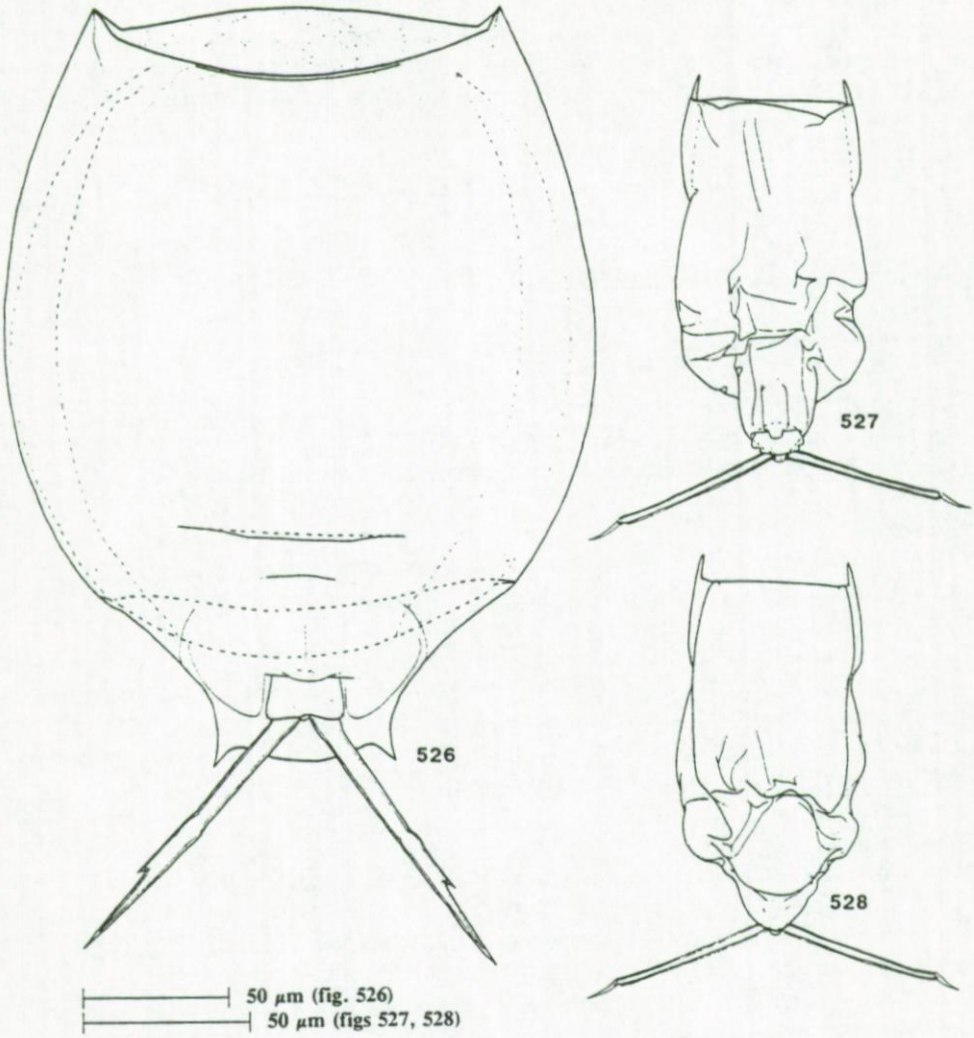


Fig. 526: L. donyanaensis, ventral view. *Figs. 527–528: L. shieli*, 527: ventral view, 528: dorsal view. (526: after Galindo *et al.*, 1994; 527-528: after Segers & Sanoamuang, 1994.)

controversial, when comparing the diagnostic characteristic between these two species with the known variability of the relevant structure in congeners such as *L. leontina*, *L. ligona* and *L. ludwigii*. However, the situation may not be the same as in these, where the common occurrence of several types of posterior projection has led to the conclusion that the phenomenon represents intraspecific variability without taxonomic significance. The situation here is probably one in which two clear cut taxa, one common, cosmopolitan and one rare, occur. As such, it is similar to the case of *L. hamata* and *L. batillifer*.

In the light of the above and until proof to the contrary, *L. donyanaensis* is thought to represent a separate species.

149. *Lecane shieli* Segers & Sanoamuang, 1994
Figs 527-528

Segers & Sanoamuang 1994 p. 40-42 figs 3a, b.

Type locality and types
Nam Pung reservoir, Sakon Nakhon province, Thailand. Holotype and paratype in the KBIN, paratypes in RUG and personal collection of L. Sanoamunang.

Differential diagnosis
L. shieli can hardly be confused with any congener, by its characteristic soft and elongate lorica, long toes and peculiar claws. The species differs from *L. eswari* by the stiffer, less elongate lorica, shorter antero-lateral spines and toes, and straight claws of the latter.

Description
Lorica relatively soft, irregularly folded through conservation. Dorsal plate consistently narrower than ventral plate, elongate. Head aperture margins nearly coincident, straight or with irregular notches. Antero-lateral corners armed with long, sharp and straight spines. Ventral plate longer than wide, generally parallel-sided, irregularly folded. No lateral sulci. Foot plate especially separated, coxal plates indistinct. Prepedal fold narrow, elongate, distally with median projection. Foot pseudosegment short, not or scarcely projecting. Toes long and slender, nearly parallel-sided, slightly outcurved distally. Claws weakly curved, inserted eccentrically.

Measurements: DPl. 94-101, DPw. 41-46, VPl. 99-115, VPw. 51-59, toe l. 48-51, claw l. 7-11.

Distribution and ecology
A single record from the type locality only.

CHECK-LIST OF NAMES AND SYNONYMS IN *LECANE*

The present list provides the names of taxa in *Lecane* that can be encountered in literature, including unavailable names and names of sub- and infrasubspecific taxa. Names for valid species are printed in bold, all others are indented. Junior synonyms are followed by the name of their senior synonym. The identity of sub- and infrasubspecific names that are considered synonym of their nominate species, *species inquirendae, nomina nuda* and other enigmatic cases is indicated.

L. abanica Segers, 1994
  L. abnobensis Hauer, 1929: see *L. ligona*
L. acanthinula (Hauer, 1938)
  L. acinaces (Mola, 1913): sp. inq.
  L. acronycha Harring & Myers, 1926: see *L. curvicornis*
L. aculeata (Jakubski, 1912)
  L. acus (Harring, 1913): see *L. lunaris*
L. aeganea Harring, 1914
  L. affinis (Levander, 1894): sp. inq.
  L. aguessei De Ridder, 1960: see *L. punctata*
L. agilis (Bryce, 1892)
  L. aliger Nogrady, 1983: see *L. spinulifera*
  L. althausi Rudescu, 1960: sp. inq.
  L. amazoniana Koste & Robertson, 1983: see *L. eutarsa*
L. amazonica (Murray, 1913)
  L. amazonica Koste & Böttger, 1992 non (Murray, 1913): see *L. eutarsa*
  L. amban (Stewart, 1908): see *L. depressa*
  L. amorpha Harring, 1914: see *L. inermis*
  L. apatinensis Živković , 1987: see *L. subtilis*
  L. appendiculata (Levander, 1894): see *L. ludwigii*
  L. appendiculata (Skorikov, 1898) non (Levander): see *L. lamellata*
  L. appendiculata (Daday, 1901) non (Skorikov) nec (Levander): see *L. ludwigii*
  L. aquila Harring & Myers, 1926: see *L. signifera*
L. arcuata (Bryce, 1891)
L. arcula Harring, 1914
  L. arcuata f. *magna* Koste, 1978: see *L. hamata*
L. armata Thomasson, 1971
L. aspasia Myers, 1917
  L. aspasia amazonica Koste & Robertson, 1983 non (Koste, 1978): see *L. robertsonae*
  L. aspersa Kutikova & Arov, 1985: see *L. rhopalura*
  L. asthena Harring & Myers, 1926: sp. inq.
  L. astia: nom. nud. in Koste & Robertson (1990)
L. asymmetrica (Murray, 1913)
  L. balatonica (Varga, 1938): sp. inq.
L. batillifer (Murray, 1913)
  L. beauchampi (von Hofsten, 1923): see *L. clara*
  L. beningi Tarnogradski, 1961: see *L. galeata*

L. bicornis (Daday, 1897): see *L. quadridentata*
L. bicornis (Stenroos, 1898) non (Daday): see *L. stenroosi*
L. bidentata Dhanapathi, 1976: sp. inq.
L. bifastigata Hauer, 1938
L. bifurca (Bryce, 1892)
L. bifurca entome Bērziņš, 1982: syn.
L. biloba (Daday, 1905): see *L. leontina*
L. bipes (Stokes, 1896): see *L. bulla*
L. blachei Bērziņš, 1973
L. boettgeri Koste, 1986
L. bondi Edmondson, 1934: see *L. curvicornis*
L. boorali Koste & Shiel, 1983
L. brachydactyla (Stenroos, 1898): see *L. depressa*
L. branchicola: nom. nud. in Piovanelli (1903)
L. braumi Koste, 1988
L. braziliensis Segers, 1993
L. brevis (Murray, 1913): see *L. flexilis*
L. brevita Myers, 1942: see *L. perpusilla*
L. brodskii (Muraveisky, 1937): see *L. closterocerca*
L. brundini Thomasson, 1959: sp. inq.
L. bryophila Koniar, 1957 (see *L. agilis*)
L. bulla (Gosse, 1851)
L. bulla constricta (Sudzuki, 1992): syn.
L. bulla constricta f. *triangulata* (Sudzuki, 1992): syn.
L. bulla dentata (Sudzuki, 1992): syn.
L. bulla var. *diabolica* (Hauer, 1936): syn.
L. bulla diana Abdullaev, 1989: syn.
L. bulla kutikovae Naberezhniyi & Irmasheva, 1975: syn.
L. calcaria Harring & Myers, 1926
L. camptica Bērziņš, 1982: see *L. hornemanni*
L. candida Harring & Myers, 1926
L. carinata (Jakubski, 1912): sp. inq.
L. carpatica Rudescu, 1960: sp. inq.
L. ceylonensis Chengalath & Fernando, 1973: see *L. hornemanni*
L. chankensis Bogoslovsky, 1958: see *L. curvicornis*
L. clara (Bryce, 1892)
L. climacois Harring & Myers, 1926
L. closterocerca (Schmarda, 1859)
L. closterocerca amazonica Koste, 1978: syn.
L. clypta Harring & Myers, 1926: nom. nud. in Voigt (1957)
L. cochlearis (Murray, 1913): sp. inq.
L. compta Harring, 1914: see *L. flexilis*
L. conspicua (Hauer, 1936): see *L. thalera*
L. constricta (Murray, 1913): see *L. lunaris*
L. copeis (Harring & Myers, 1926)
L. cornuta (Müller, 1786)
L. cornuta f. *anglica* (Bryce, 1924): see *L. closterocerca*
L. cornuta oidipus (Hauer, 1956): syn.

L. cornuta (Schmarda, 1859) non (Müller): see *L. quadridentata*
L. crenata (Harring, 1913): see *L. lunaris*
L. crepida Harring, 1914
L. crepida var. *bengalensis* Sharma, 1978: syn.
L. crepida longidactyla Koste, 1972: syn.
L. crypta (Hauer, 1938): see *L. bifurca*
L. cupha (Gosse, 1887): sp. inq.
L. curvicerata Yamamoto, 1951: see *L. aculeata*
L. curvicornis (Murray, 1913)
L. curvicornis var. *miamiensis* Myers, 1941: syn.
L. curvicornis var. *padespares* Arora, 1965: syn.
L. curvicornis var. *rigida* Murray: lapsus
L. curvilinealis Arora, 1965: see *L. curvicornis*
L. decipiens (Murray, 1913)
L. dentiserrata (Mola, 1913): sp. inq.
L. depressa (Bryce, 1891)
L. deridderae Koste, 1972
L. deridderae De Paggi, 1989 non Koste: see *L. margarethae*
L. diadema Hauer, 1931: see *L. kluchor*
L. diomis (Gosse, 1887): sp. inq.
L. diophthalma (Iroso, 1910): sp. inq.
L. donneri Chengalath & Mulamoottil, 1974
L. donneriana Dhanapathi, 1976: see *L. ungulata*
L. donyanaensis Mazuelos & Segers, 1994
L. dorsicalis Arora, 1965: see *L. luna*
L. dorsicornuta (Van Oye, 1926): sp. inq.
L. doryssa Harring, 1914
L. dumonti Segers, 1993
L. dysoarata Myers, 1942 (see *L. bifurca*)
L. eichsfeldica (Künne, 1926): see *L. closterocerca*
L. elachis (Harring & Myers, 1926): see *L. furcata*
L. elasma Harring & Myers, 1926
L. elegans Harring, 1914
L. elliptoides (Rodewald, 1937): sp. inq.
L. elongata Harring & Myers, 1926
L. elsa Hauer, 1931
L. emarginata (Eichwald, 1847): see *L. luna*
L. ephestra Harring, 1921: see *L. intrasinuata*
L. ercodes Harring, 1914: see *L. ludwigii*
L. eswari Dhanapathi, 1976
L. eupsammophila Koste, 1992: see *L. copeis*
L. eutarsa Harring & Myers, 1926
L. eylesi Russell, 1953
L. fadeevi (Neiswestnova-Shadina, 1935): see *L. psammophila*
L. falcata (Murray, 1913): sp. inq.
L. fernandoi Chengalath & Mulamoottil, 1974: see *L. hamata*
L. flabellata Edmondson, 1936 (see *L. lamellata*)
L. flexilis (Gosse, 1886)

L. flexiloides Wulfert: nom. nud. in Bērziņš (1967)
L. fracida Bērziņš, 1982: see *L. ungulata*
L. formosa Harring & Myers, 1926 (see *L. aeganea*)
L. furcata (Murray, 1913)
L. fusilis Myers, 1936: see *L. bifurca*
L. galeata (Bryce, 1892)
L. gillardi (Bērziņš, 1960)
L. gissensis (Eckstein, 1883): sp. inq.
L. glandulosa (Stokes, 1897): see *L. ungulata*
L. glumiformis (Bory de St. Vincent, 1827) invalid nom. nov. for *Trichoda cornuta* Müller, see *L. cornuta*
L. glypta Harring & Myers, 1926: see *L. flexilis*
L. glypta f. *nuda* Russell, 1956: see *L. flexilis*
L. goniata (Harring & Myers, 1926): see *L. bulla*
L. gossei (Lord, 1890): sp. inq.
L. gracilis (Sachse, 1915): sp. inq.
L. grandis (Murray, 1913)
L. gwileti (Tarnogradski, 1930)
L. haliclysta Harring & Myers, 1926
L. hamata (Stokes, 1896)
L. hamata victoriensis Koste & Shiel, 1980: syn.
L. hamata f. *arcuata* Koste, 1978: syn
L. harringi (Ahlstrom, 1934): see *L. punctata*
L. hastata (Murray, 1913)
L. hegurensis Yamamoto, 1951: see *L. hastata*
L. herzigi Koste, Shiel & Tan, 1988
L. hoffmanni De Ridder, 1960: see *L. paradoxa*
L. hornemanni (Ehrenberg, 1834)
L. hospes Donner, 1951: sp. inq.
L. hudsoni (Lord, 1890): sp. inq.
L. hummelincki De Ridder, 1977: sp. inq.
L. ichthyoura (Anderson & Shephard, 1892): see *L. ludwigii*
L. imbricata Carlin, 1939: sp. inq.
L. inconspicua Segers & Dumont, 1993
L. inermis (Bryce, 1892)
L. infula Harring & Myers, 1926
L. inopinata Harring & Myers, 1926
L. inquieta Myers, 1936 (see *L. clara*)
L. incisa (Daday, 1897): see *L. bulla*
L. incisa (Daday, 1905) non (Daday): see *L. leontina*
L. intrasinuata (Olofsson, 1917)
L. islandica De Ridder, 1967: see *L. mira*
L. ivli (Wiszniewski, 1935)
L. jana Abdullaev, 1989: see *L. hastata*
L. jaintiaensis Sharma, 1987 (see *L. signifera*)
L. janetzkyi Koste, Janetzky & Vareshi, 1991: see *L. asymmetrica*
L. jessupi Harring, 1921: see *L. ligona*
L. jobloti (Bory de St. Vincent, 1827): see *L. luna*

L. jorroi (Arévalo, 1918): see *L. ludwigii*
L. junki Koste, 1975
L. kahouteki Chengalath, Fernando & Koste, 1974: sp. inq.
L. kawamurai Yamamoto: nom. nud. in Yamamoto (1960)
L. kieferi (Hauer, 1931): see *L. gwileti*
L. kluchor Tarnogradski, 1930
L. korschelti (Mola, 1913): sp. inq.
L. kostei De Ridder, 1966: see *L. latissima*
L. kutikova Koste, 1978: junior objective synonym of *L. kutikowa*
L. kutikowa Koste, 1972
L. lamellata (Daday, 1893)
L. lamiranoensis Bērziņš, 1982: see *L. hornemanni*
L. lankae Chengalath, Fernando & Koste, 1974: sp. inq.
L. lateralis Sharma, 1978
L. latissima Yamamoto, 1955
L. latvica (Bērziņš, 1943): see *L. closterocerca*
L. lauterborni Hauer, 1924
L. latifrons (Gosse, 1887): sp. inq.
L. lebedevae Abdullaev, 1989: see *L. elongata*
L. leontina (Turner, 1892)
L. leontina bisinuata (Daday, 1905): syn.
L. leura Myers, 1942 (see *L. eylesi*)
L. levistyla (Olofsson, 1917)
L. ligona (Dunlop, 1901)
L. lipara (Gosse, 1887): see *L. flexilis*
L. lofuana (Murray, 1913): see *L. curvicornis*
L. longidactyla (Edmondson, 1948): see *L. clara*
L. longidactyla Arora, 1965 non (Edmondson): see *L. curvicornis*
L. lordii (Gosse, 1886): sp. inq.
L. ludwigii (Eckstein, 1883)
L. ludwigii var. *abrupta* Hauer, 1938: syn.
L. ludwigii var. *brevicaudata* Hauer, 1938: syn.
L. ludwigii var. *lacinulata* Hauer, 1938: syn.
L. ludwigii var. *laticaudata* Hauer, 1938: syn.
L. luna (O.F. Müller, 1776)
L. luna balatonica Varga, 1945: syn.
L. luna var. *presumpta* Ahlstrom, 1938: see *L. papuana*
L. luna var. *intermedia* Bērziņš, 1982 : syn.
L. lunaris (Ehrenberg, 1832)
L. lunaris f. *aperta* (Steinecke, 1916): see *L. obtusa*
L. lunaris australis Bērziņš, 1982: syn.
L. lunaris obserata (Steinecke, 1916): syn.
L. lunaris arthrodactyla Bērziņš, 1982: syn.
L. lunaris f. *granulata* Koste, 1978: syn.
L. macrodactyla (Daday, 1898): see *L. leontina*
L. macrognatha (Schmarda, 1859): sp. inq.
L. magna (Stenroos 1898): see *L. ungulata*
L. magna (Lucks, 1912) non (Stenroos): see *L. ungulata*

L. magna tenuior (Stenroos, 1898): see *L. ungulata*
L. marchantaria Koste & Robertson, 1983
L. margalefi De Manuel, 1994
L. margarethae Segers, 1991
L. marshi Harring, 1914: see *L. ludwigii*
L. marlieri Gillard, 1965: sp. inq.
L. matsaluensis Riikoja, 1933: sp. inq.
L. mawsoni Russell, 1958: sp. inq.
L. melini Thomasson, 1953
L. methoria Harring & Myers, 1926: see *L. stichaea*
L. minnesotensis (Herrick, 1885): sp. inq.
L. minuta Segers, 1994
L. mira (Murray, 1913)
L. mitella (Myers, 1936) (see *L. psammophila*)
L. mitis Harring & Myers, 1926: see *L. levistyla*
L. mollis (Gosse, 1887): sp. inq.
L. mologensis (Bogoslovsky, 1935): see *L. furcata*
L. monostyla (Daday, 1897)
L. monostyla bryocola: nom. nud. in Sudzuki (1971)
L. monostylaeformis (Stenroos, 1898): see *L. bifurca*
L. mucronata Harring & Myers, 1926
L. murrayi Korde, 1927: see *L. subtilis*
L. murrayi Hauer, 1965 non Korde: see *L. amazonica*
L. murrayi f. *larga* Koste, 1978: ?syn of *L. amazonica*
L. muscicola (Bryce, 1891): sp. inq.
L. myersi Segers, 1993
L. mylacris Harring & Myers, 1926: see *L. intrasinuata*
L. myriophilli (Varga, 1945): sp. inq.
L. namibiensis (Koste & Brain, 1993): see *L. hastata*
L. nana (Murray, 1913)
L. nana var. *monostyla* Rodewald, 1940: syn.
L. neali Wulfert, 1966: see *L. crepida*
L. nelsoni Segers, 1994
L. nigeriensis Segers, 1993
L. niothis Harring & Myers, 1926
L. nitida (Murray, 1913): see *L. curvicornis*
L. nodosa Hauer, 1938: see *L. hornemanni*
L. nodosa elongata: nom. nud. in Sudzuki *et al.* (1992)
L. nwadiaroi Segers, 1993
L. nymphae: nom. nud. in Sudzuki (1989)
[*Lecane oblonga* (Runnstrom, 1909) Harring, 1913a (ex. *Dystyla*): in *Mytilina*]
L. obtusa (Murray, 1913)
L. ohioensis (Herrick, 1885): see *L. ludwigii*
L. oophthalma (Schmarda, 1859): sp. inq.
L. opias (Harring & Myers, 1926)
L. ordwayi Bienert, 1986
L. ornata (Daday, 1897): see *L. ludwigii*
L. ornata (Harring & Myers, 1926) non (Daday) see *L. myersi*

L. ovalis (Jakubski, 1914): see *L. furcata*
L. ovata (Forbes, 1893): sp. inq.
L. oxycauda (Stenroos, 1898): see *L. ludwigii*
L. ozensis Yamamoto, 1953: see *L. paradoxa*
L. ozolini (Bērziņš, 1943): see *L. bulla*
L. palinacis Harring & Myers, 1926
L. papuana (Murray, 1913)
L. paraclosterocerca (Pennac, 1939): see *L. pyriformis*
L. paradoxa (Steinecke, 1916)
L. paradecipiens Nayar, 1968: see *L. thalera*
L. parva (Daday, 1897): see *L. galeata*
L. pawlowskii Wulfert, 1966
L. paxiana Hauer, 1940
L. pauliana Bērziņš, 1960: sp. inq.
L. pelatis Harring & Myers, 1926 (see *L. robertsonae*)
L. perplexa (Ahlstrom, 1938): see *L. lunaris*
L. perpusilla (Hauer, 1929)
L. pertica Harring & Myers, 1926
L. physalis Wulfert, 1939: see *L. bulla*
L. pideis (Harring & Myers, 1926)
L. piepelsi De Smet & Bafort, 1990: see *L. arcuata*
L. piovanelli Bartoš, 1957: sp. inq.
L. plesia Myers, 1936: see *L. hastata*
L. plesiaides Chengalath & Fernando, 1973: sp. inq.
L. ploenensis (Voigt, 1902): see *L. signifera*
L. pomiformis Edmondson, 1938: see *L. pyriformis*
L. prehensor (Gosse, 1887): sp. inq.
L. proiecta Hauer, 1956
L. psammophila (Wiszniewski, 1932)
L. pumila (Rousselet, 1906)
L. punctata (Murray, 1913)
L. punctata Carlin-Nilsson, 1934 non (Murray): see *L. tenuiseta*
L. pusilla Harring, 1914
L. pustulosa Myers, 1938 (see *L. hornemanni*)
L. pycina Harring & Myers, 1926: see *L. ligona*
L. pygmaea (Daday, 1897): see *L. galeata*
L. pyriformis (Daday, 1905)
L. pyrrha Harring & Myers, 1926
L. quadridentata (Ehrenberg, 1832)
L. quadridentata arthrodactyla Bērziņš, 1982: syn.
L. quadridentata f. *gigantea* Koste, 1988: syn.
L. quennerstedti (Bergendal, 1892): see *L. lunaris*
L. quintata: nom. nud. in Sudzuki *et al.* (1992)
L. remanei Hauer, 1964
L. rhacois Harring & Myers, 1926
L. rhenana Hauer, 1929
L. rhopalura (Harring & Myers, 1926)
L. rhytida Harring & Myers, 1926

L. robertsonae Segers, 1993
L. robusta (Stokes, 1896): see *L. cornuta*
L. romeroi Pardo, 1931: not examined
L. rotunda (Fadeev, 1927): see *L. cornuta*
L. rotundata (Jakubski, 1914): see *L. cornuta*
L. rotundata (Olofsson, 1918) non (Jakubski): see *L. latissima*
L. rudescui Hauer, 1965
L. rugosa (Harring, 1914)
[*Lecane rukiensis* (Van Oye, 1926) Wiszniewski, 1954: see *Platyias quadricornis*]
L. rusticola (Gosse, 1886): sp. inq.
L. ruttneri Hauer, 1938
L. rylovi Tarnogradski, 1961: see *L. subulata*
L. saginata Harring & Myers, 1926: see *L. stichaea*
L. sagula Harring & Myers, 1926
L. satyrus Harring & Myers, 1926
L. schraederi Wulfert, 1966
L. scutaria (Stokes, 1897): see *L. leontina*
L. scobis Harring & Myers, 1926: see *L. levistyla*
L. scutata (Harring & Myers, 1926)
L. serrata (Hauer, 1933)
L. serrata f. *echinata* Koste, 1988: syn.
L. sexidentata (Van Oye, 1926): see *L. quadridentata*
L. shieli Segers & Sanoamuang, 1994
L. sibina Harring, 1914: sp. inq.
L. signifera (Jennings, 1896)
L. signifera glandulosa Sudzuki, 1991: syn.
L. similis Russell, 1958: sp. inq.
L. simonneae Segers, 1993
L. sinuata (Hauer, 1938): see *L. hamata*
L. sinuosa Nogrady, 1957: sp. inq.
L. sola Hauer, 1936
L. solfatara (Hauer, 1938)
L. spenceri (Shephard, 1892): sp. inq.
[*Lecane spinifera* (Western, 1894) Harring, 1913a (ex. *Distyla*): see *Wolga spinifera*]
L. spinifera (Idelson, 1924): see *L. monostyla*
L. spinifera (Edmondson, 1934) non (Idelson): see *L. spinulifera*
L. spiniventris Segers, 1994
L. spinulifera Edmondson, 1935
L. stenroosi (Meissner, 1908)
L. stenroosi var. *lineata* (Wulfert, 1966): syn.
L. stenroosi var. *california* (Wulfert, 1966): syn.
L. stephensae (Hutchinson, 1931)
L. stichaea Harring, 1913
L. stichaea var. *amazonica* Koste, 1978: see *L. eutarsa*
L. stichaeoides Hauer, 1938: see *L. haliclysta*
L. stichoclysta Segers, 1993

L. stokesi (Pell, 1890): see *L. ludwigii*
L. strandi Bērziņš, 1943: see *L. arcula*
L. striata (Gosse, 1887): sp. inq.
L. stroeszneri (Török, 1935): see *L. scutata*
L. styrax (Harring & Myers, 1926): see *L. bulla*
L. styrax longistyla (Weisig, 1928): see *L. bulla*
L. submagna De Ridder, 1960: see *L. luna*
L. subtilis Harring & Myers, 1926
L. subulata (Harring & Myers, 1926)
L. sulcata (Gosse, 1886): sp. inq.
L. supinoi Manfredi, 1929: see *L. inermis*
L. sverigis Ahlstrom, 1934: see *L. ungulata*
L. sylvatica (Harring, 1913): see *L. lunaris*
L. sylviae Segers, 1993
L. symoensi De Ridder, 1981 (see *L. closterocerca*)
L. sympoda Hauer, 1929
L. syngenes (Hauer, 1938)
L. tabida Harring & Myers, 1926
L. tabulifera Edmondson, 1936 (see *L. ungulata*)
L. tasmaniensis Shiel & Koste, 1985: see *L. eylesi*
[*Monostyla tentaculata* Cosmovici, 1892: probably a *Lepadella* (see Harring, 1913a)]
L. tenua Myers, 1936 (see *L. clara*)
L. tenuiseta Harring, 1914
L. tenuiseta spina: nom. nud. in Sudzuki *et al.* (1992)
L. terracianoi (Mola, 1913): sp. inq.
L. tesselata Arora, 1965: see *L. curvicornis*
L. testudinea (Mola, 1913): sp. inq.
L. tethis (Harring & Myers, 1926): see *L. furcata*
L. thailandensis Segers & Sanoamuang, 1994
L. thalera (Harring & Myers, 1926)
L. thienemanni (Hauer, 1938)
L. thomassoni Wulfert, 1965: see *L. leontina*
L. triloba Yamamoto, 1951: see *L. curvicornis*
L. tryphema Harring & Myers, 1926
L. truncata (Turner, 1892): sp. inq.
L. truncata (Leissling, 1914) non (Turner): see *L. depressa*
L. truncata Yamamoto, 1953 non (Leissling) nec (Turner): see *L. depressa*
L. tudicola Harring & Myers, 1926: see *L. depressa*
L. turbo (Murray, 1913): see *L. galeata*
L. tuxeni De Ridder, 1970: sp. inq.
L. uenoi Yamamoto, 1951
L. undulata Hauer, 1938
L. unguitata (Fadeev, 1925)
L. unguitata africana Koste, 1978: syn.
L. ungulata (Gosse, 1887)
L. ungulata australiensis Koste & Shiel, 1990: syn.
L. ungulata (Mola, 1913) non (Gosse): sp. inq.

L. urna Nogrady, 1962
L. vandenbrandei (Gillard, 1957): sp. inq.
L. vanmeeli De Ridder, 1960: sp. inq.
L. vanoyei De Ridder, 1960: see *L. furcata*
L. vargai (Török, 1935): see *L. ivli*
L. vastita (Harring & Myers, 1926): see *L. obtusa*
L. vasisthi Sharma, 1980: see *L. crepida*
L. venusta Harring & Myers, 1926
L. verecunda Harring & Myers, 1926
L. virga (Harring, 1914): see *L. lunaris*
L. weberi (Mola, 1913): sp. inq.
L. weissei (Eichwald, 1847): sp. inq.
L. whitfordi (Ahlstrom, 1938) (see *L. obtusa*)
L. wulferti Hauer, 1956: see *L. closterocerca*
L. yamunensis Novotná-Dvorakova, 1962: see *L. papuana*
L. zwaiensis Bryce, 1931: see *L. curvicornis*

LITERATURE

Abdullaev, C. T., 1989. Novie i redkie vidai kolovratok (Rotifera) iz vodoemov dagestanskoii ASSR. Zool. J. 48: 127-129 (in russian).

Ahlstrom, E. H., 1934. Rotatoria of Florida. Trans. Amer. Microsc. soc. 53: 251-266.

Ahlstrom, E. H., 1938. Plankton Rotatoria from North Carolina. J. Mitchel Sci. soc. 54: 88-110.

Anderson, H. H. & J. Shephard, 1892. Notes on Victorian rotifers. Proc. Royal Soc. Victoria, Melbourne, n. ser., 4: 69-80.

Arévalo, C., 1918. Algunos Rotíferos planktónicos de la Albufera de Valencia. Anales. Ins. Gen. Tecn. Valencia 8: 1-47.

Arora, H. C., 1965. Studies on Indian Rotifera-Part VI: On a collection of Rotifera from Nagpur, India, with four new species and a new variety. Hydrobiologia, 26: 444-456.

Bancsi, I., 1988. A kerekesférgek ROTATORIA kishatározójaII (Key to Rotatoria). Bp. VGI, Budapest 1988. Vízügyi Hidrobiológia 17, 173-578

Bartoš, E., 1957. Vířníci žaberního prostoru sladkovodního kraba (*Potamon potamon*). Věstn. Česk. Zool. Spol. 21: 376-380

Bartoš, E., 1959. Vířníci -Rotatoria. Fauna ČSR, 15. Československá Akademie Věd, Praha, 969pp.

Beauchamp, P., de, 1965. Classe des Rotifères. *in*: P. P. Grassé, Traité de Zoologie. Anatomie, Systématique, Biologie IV: 1225-1379.

Bergendal, D., 1892. Beiträge zur Fauna Grönlands. I. Zur Rotatorienfauna Grönlands. Acta Univ. Lundensis 28: 180 pp.

Bērziņš, B., 1943. Systematisch-faunistiches Material über Rotatorien Lettlands. Folia Zoologica et Hydrobiologica, 12: 218-244.

Bērziņš, B., 1959. Rotatorien aus Französch-Westafrika. Bull. Inst. franç. Afrique Noir, A21: 921-933.

Bērziņš, B., 1960. Neue Rotatorienarten aus Madagascar. Mém. inst. sci. Madagascar 14: 1-6.

Bērziņš, B., 1967. Rotatoria. *In*: Illies, J. (ed.): Limnofauna Europaea: 35-68.

Bērziņš, B., 1973. Some Rotifers from Cambodia. Hydrobiologia 41: 453-459.

Bērziņš, B., 1982a. Contribution to the knowledge of Rotatoria of Australia. AV- centralen i Lund, April 1982 24pp., 11 plates.

Bērziņš, B., 1982b. Zur Kenntnis der Rotatorienfauna von Madagascar. AV- centralen i Lund, April 1982, 24pp., 12 plates.

Bienert, R. W., 1986. A new species of *Lecane* (Rotifera: Lecanidae) from subtropical Florida. Hydrobiologia 141: 175-177.

Bogoslovski, A. S., 1935. [Die rotatorien der Beshezker Gewässer nach den Expeditionsmaterialen der Biol. Station Bolschewo]. Bull. st. Biol. Bolchewo 7-8: 101-123 (in Russian).

Bogoslovski, A. S., 1958. [Two new rotifer species - *Paradicranophorus verae* sp. n. and *Lecane chankensis* sp. n.] Zool. J. 37: 622-624 (in Russian).

Bory de St. Vincent, J.-B. G. M. M., 1927. Encyclopédie méthodique. Histoire naturelle des zoophytes, ou animaux rayonnés, faisant suite à l'histoire naturelle des vers de Bruguière. pp. 377-819.

Brain, C. K. & W. Koste, 1993. Rotifers of the genus *Proales* from saline springs in the namib desert, with the description of a new species. Hydrobiologia 255/256: 449-454.

Brandorff, G.-O., W. Koste & N. N. Smirnov, 1982. The composition and structure of rotiferan and crustacean cummunities of the lower Rio Nhamunda, Amazonas, Brazil. Studies on Neotropical Fauna and Environment 17: 69-121.

Brauer, A., 1912. Die Süsswasserfauna Deutschlands, Heft 14: Rotatoria und Gastrotricha. Gustav Fischer Verlag, Jena, 273pp.

Brooks, J. L., 1957. The species problem in freshwater animals. *In*: E. Mayr (ed.), The species problem. Amer. Ass. Advanc. Sci. 50: 80-123.

Bryce, D., 1891. Remarks on *Distyla*, with descriptions of three new rotifers. Sci. gossip 27: 204-207.

Bryce, D., 1892. On some moss-dwelling Cathypnidae; with descriptions of five new species. Sci. gossip 28: 271-275.

Bryce, D., 1924. The Rotifera and Gastrotricha of Devil's and Stump Lakes, North Dakota, U.S.A. Journ. Quekett microscop. Club 15: 81-108.

Bryce, D., 1931. Report on the Rotifera: Mr. Omer-Cooper's Investigation of the Abyssinian Fresh Waters (Dr. Hugh Scott Expedition). Proc. Zool. Soc. London 3: 865-878.

Carlin, B., 1939. Über die Rotatorien einiger Seen bei Aneboda. Medd. Lunds Univ. Limnol. Inst. 2: 68pp.

Carlin-Nilsson, B., 1934. Über einige für Schweden neue Rotatorien. Ark. Zool. 26: 1-14.
Carlin-Nilsson, B., 1939. Über die Rotatorien einiger Seen bei Aneboda. Medd. Lunds Univ. Limnol. Inst. 2: 3-68.
Chengalath, R. & C. H. Fernando, 1973. Rotifera from Sri Lanka (Ceylon) I. The genus *Lecane* with descriptions of two new species. Bull. Fish. Res. Stn., Sri lanka (Ceylon) 24: 13-27.
Chengalath, R., C. H. Fernando & W. Koste, 1974. Rotifera from Sri Lanka (Ceylon) 3. New species and records with a list of Rotifera recorded and their distribution in different habitas from Sri Lanka. Bull. Fish. Res. Stn., Sri lanka (Ceylon) 25: 83-96.
Chengalath, R., & G. Mulamoottill, 1974. Littoral Rotifera of Ontario – Genus *Lecane*, with descriptions of two new species. Can. J. Zool. 52: 947-957.
Chengalath, R. & W. Koste, 1988. Composition of littoral rotifer communities of Cape Breton Island, Nova Scotia, Canada. Verh. Internat. Verein Limnol. 23: 2019-2027.
Chengalath, R. & W. Koste, 1989. Composition and distributional patterns in arctic rotifers. Hydrobiologia 186/187: 191-200.
Daday, E., 1893. Adatok az alföldi székes vizek mikrofaunájának ismeretéhez. Math. Termész. Értesitö 12: 10-43.
Daday, E., 1897. Új-Guineai Rotatoriák. (Rotatoria novae Guineae). Math. Termész. Értesitö 15: 131-148.
Daday, E., 1898. Mikroscopische Süsswasserthiere aus Ceylon. Termész. Füzetek, Budapest, vol. 21, Anhangsheft, 123 pp.
Daday, E., 1901. Zoologische Ergebnisse der dritten asiatischen Forschungsreise des Grafen Eug. Zichy. Vol. 2: 375-479.
Daday, E., 1905. Untersuchungen über die Süsswasser-Mikrofauna Paraguays. Zoologica, Stuttgart, 44: 374pp.
De Manuel, J., 1994. Taxonomic and zoogeographic considerations on Lecanidae (Rotifera: Monogononta) of the Balearic archipelago, with the desciption of *Lecane margalefi* n. sp. Hydrobiologia 288: 97-105.
De Manuel, J., J. LL. Pretus & D. Jaume, 1992. Rotifers from the Balearic archipelago. Hydrobiologia 239: 33-41.
De Ridder, M., 1960. Ecologisch-Faunistische studie van de raderdiertjes van de Camargue (Zuid-Frankrijk) met beschouwingen over de taxonomie van vijf nieuwe soorten. Verhandel. Kon. Vl. Acad. Wetensch., Lett. en Schone Kunsten Belg. Klasse Wetensch., 22 nr. 65: 201pp.
De Ridder, M., 1966. Rotatoriën van IJsland. Wetenschappelijke resultaten der studiereis van Prof. Dr. P. van Oye op Ijsland. Biol. Jaarb. 35: 122-161.
De Ridder, M., 1967. Rotatoriën van Ysland. II. Natuurw. Tijdschr. 49: 216-228.
De Ridder, M., 1969. Raderdieren uit de omgeving van Budir. Biol. Jb. Dodonaea, 37: 140-185.
De Ridder, M., 1970. Raderdieren van Ysland. IV. Verhandel. Kon. Vl. Acad. Wetensch., Lett. en Schone Kunsten Belg. Klasse Wet. 32: 44pp.
De Ridder, M., 1977. Rotatoria of the Caribbean Region. Studies on the fauna of Curaçau and other Caribbean Islands, 52(171): 72-134.
De Ridder, M., 1981. Rotifera. *in*: Hydrobiological survey of the lake Bangweulu, Luapula river Basin (J.J. Symoens ed.), vol. XI fasc. 4, 191 pp.
De Ridder, M., 1987. Annotated checklist of non-marine rotifers (Rotifera) from African inland waters. Kon. Mus. Midd.-Afrika, Tervuren. Zool. Doc. 21, 123pp.
De Ridder, M., 1991. Rotifers from Algeria. J. Afr. Zool. 105: 473-483.
De Smet, W. H., 1993. Report on rotifers from Barentsøya, Svalbard (78°30'N). Fauna norv. Ser. A 14: 1-26.
De Smet, W. H. & J. M. Bafort, 1990a. Contributions to the rotifers of the Canadian High Arctic. 1. Monogonont rotifers from Little Cornwallis Island, Northwest Territories. Naturaliste can. (Rev. Écol. Syst.) 117: 253-261.
De Smet, W. H. & J. M. Bafort, 1990b. Rotifers from the Kilimanjaro. Biol. Jb. Dodonaea 58: 120-130.
Dhanapathi, M. V. S. S. S., 1976a. Rotifers from Andra Pradesh, India-III., Family Lecanidae including two new species. Hydrobiologia 48: 9-16.
Dhanapathi, M. V. S. S. S., 1976b. A new Lecanid Rotifer from India. Hydrobiologia 50: 191-192.
Donner, J., 1951. Rotatorien der Humusboden. III. Zool. Jahrb. Abt. Syst. Ökol. Geogr. 79: 614-638.
Donner, J., 1954. Zur Rotatorienfauna Südmährens. Österr. zool. Z. 5: 30-117.
Dunlop, M. F., 1901. On a new rotifer, *Cathypna ligona*. J. Quekett Micr. Club, ser. 2, 8: 29-32.
Eckstein, K., 1883. Die Rotatorien der Umgegend von Giessen. Zeitschr. Wiss. Zool., Leipzig 39: 343-443.

Edmondson, W. T., 1934. Investigations of some Hispanolian lakes. I. The Rotatoria. Arch. Hydrobiol. 26: 465-471.
Edmondson, W. T., 1935. Some Rotatoria from Arizona. Trans. Amer. Micr. Soc. 54: 301-306.
Edmondson, W. T., 1936. New Rotatoria from New England and New Brunswick. Trans. Amer. Micr. Soc. 55: 214-222.
Edmondson, W. T., 1938. Three new species of Rotatoria. Trans. Amer. Micr. Soc. 57: 153-157
Edmondson, W. T., 1948. Two new species of Rotatoria from sand beaches, with a note on *Collotheca wiszniewskii*. Trans. Amer. Micr. Soc. 67: 149-152.
Edmondson, W. T. & G. E. Hutchinson, 1934. Report on Rotatoria. Yale North India Expedition. Art. IX. Mem. Connecticut Acad. Arts Sci., 10: 153-186.
Ehrenberg, C. G., 1830. Organisation, Systematiek und geographisches Verhältniss der Infusionsthierchen. Zwei Vorträge in der Akademie der Wissenschaften zu Berlin gehalten in den Jahren 1828 und 1830. Folio. Berlin. 108pp
Ehrenberg, C. G., 1832. Über die Entwickelung und Lebensdauer der Infusionsthiere, nebst fernere Beiträgen zu einer Vergleichung ihrer organischen Systeme. Abh. Akad. Wiss., Berlin (for 1831): 1-154.
Ehrenberg, C. G., 1834. Dritter Beitrag zur Erkenntniss grosser Organisation in der Richtung des kleinsten Raumes. Abh. Akad. Wiss., Berlin: 145-336.
Ehrenberg, C. G., 1838. Die Infusionsthierchen als vollkommene Organismen. Ein Blick in das tiefere organische Leben der Natur. Folio. Leipzig, XVIII+547 pp.
Eichwald, V., 1847. Erster nachtrag zur Infusorienkunde Russlands. Bull. Soc. Imp. Nat., Moscou, 20: 285-366.
Fadeev, N., 1924. Materialy k poznanin fauny Kolovratok Rossii. Neskolko zametehanyi o Shodstve fauny Kolovratok Rossii i Ameriky. Russ. gidrobiol. Z. 3: 3-5 (in Russian).
Fadeev, N., 1925. Materialy k poznanin fauny Kolovratok. Neskolko danniih po fauny Rossii. Trudy Harkobskogo obskestva ispytateley prirody, 50, 1: 15-25 (in Russian).
Fadeev, N., 1927. Materialy k poznanin fauny Kolovratok S.S.S.R. O neskolkyh redkyh i noryh kolovratkak naidennyh v predelah S.S.S.R. Trudy Charkivskogo Tov. Doslid. Prirody 50: 141-155 (in Russian).
Forbes, S. A., 1893. A preliminary report upon the aquatic invertebrate fauna of the Yellowstone National Park, Wyoming, and of the Flathead region of Montana. Bull. U.S. Fish Comm. 11 (1891): 207-258.
Galindo, M. D., L. Serrano, H. Segers, N. Mazuelos, 1994. *Lecane donyanaensis* n. sp. (Rotifera: Monogononta, Lecanidae), from the Doñana National Park (Spain). Hydrobiologia 284: 235-239.
Gillard, A., 1957. Exploration hydrobiologique du lac Tanganyika. Rotifères. Mém. Inst. roy. Sc. nat. Belg. 3: 3-26.
Gillard, A., 1967. Rotifères de l'Amazonie. Bull. Inst. r. Sci. nat. Belg. 43: 1-20.
Godenau, S., 1961. Contribution à la conaissance des Rotifères de la Republique Roumaine (II). Comunicarile Acad. Republ. Romîne 11: 1203-1212.
Gosse, P. H., 1851. A catalogue of Rotifera found in Britain, with descriptions of five new genera and thirty-two new species. Ann. Mag. Nat. Hist., London, ser. 2. 8: 197-103.
Gosse, P. H., 1887a. Twenty-four new species of Rotifera. Journ. Roy. Mircrosc. Soc.: 1-7.
Gosse, P. H., 1887b. Twelve new species of Rotifera. Journ. Roy. Microsc. Soc.: 361-367.
Gosse, P. H., 1887c. Twenty-four more new species of Rotifera. Journ. Roy. Micr. Soc.: 861-871.
Granados-Corona, M., Martín-Vicente, A. & Garcia-Novo, F., 1988. Long-term vegetation changes on the stabilized dunes of Doñana National Park (SW, Spain). Vegetatio 75: 245-266.
Hada, Y., 1938. Rotatorian fauna of Manchoukuo. Trans. Sapporo Nat. Hist. Soc. 15: 171-186.
Harring, H. K., 1913a. Synopsis of the Rotatoria. Bull. U.S. Nat. Museum 81: 226 pp.
Harring, H. K., 1913b. A list of the Rotatoria of Washington and vicinity, with descriptions of a new genus and ten new species. Proc. U.S. Nat. Museum, 46: 387-405.
Harring, H. K., 1914. Report on Rotifera from Panama with descriptions of new species. Proc. U.S. Nat. Museum 47: 525-564.
Harring, H. K., 1921. Rotatoria. Rep. Canadian Arctic Exped. 1913-1918, Ottawa, 8: 1-23.
Harring, H. K. & F. J. Myers, 1926. The Rotifer Fauna of Wisconsin. III. A revision of the genera *Lecane* and *Monostyla*. Trans. Wisconsin Acad. Sci., Arts and Letters 22: 315-423.
Hauer, J., 1924. *Lecane lauterborni* n. sp. und einige für die deutsche Fauna neue *Lecane*- und *Monostyla*-Arten. Zool. Anz. 61: 145-149.
Hauer, J., 1925. Rotatorien aus des Salzgewässern von Oldesloe (Holstein). Mitt. Geogr. Gesell. nat. Hist. Museum Lübeck, II Reiche 30: 152-195.
Hauer, J., 1929. Zur Kenntnis der Rotatoriengenera *Lecane* und *Monostyla*. Zool. Anz. 83: 143-164.
Hauer, J., 1931. Zur Rotatorienfauna Deutschlands (II). Zool. Anz. 93: 7-13.

Hauer, J., 1935a. Zur Rotatorienfauna Deutschlands (IV). Zool. Anz. 110: 260-264.
Hauer, J., 1935b. Rotatorien aus dem Schluchseemoor und seiner Umgebung. Ein Beitrag zur Kenntnis der Rotatorienfauna der Schwarzwaldhochmoore. Verh. Naturwiss. ver. Karlsruhe 31: 47-130.
Hauer, J., 1936a. Zur Rotatorienfauna Deutschlands (V). Zool. Anz. 113: 154-157.
Hauer, J., 1936b. Neue Rotatorienarten aus Indien. Zool. Anz. 116: 77-80.
Hauer, J., 1937. Die Rotatorien von Sumatra, Java und Bali nach den Ergebnissen der Deutschen Limnologischen Sunda-Expedition. Teil I. Arch. Hydrobiol., suppl. Bd. XV (2), 296-384.
Hauer, J., 1938. Die Rotatorien von Sumatra, Java und Bali nach den Ergebnissen der Deutschen Limnologischen Sunda-Expedition. Teil II. Arch. Hydrobiol., suppl. Bd. XV (3), 507-602.
Hauer, J., 1940. Beitrag zur Kenntnis der Rotatorien warmer Quellen Deutschlands. Zool. Anz. 130: 156-158.
Hauer, J., 1956. Rotatorien aus Venezuela und Kolombien. Ergebnisse der deutschen Limnol. Venezuela-Expedition 1952 1: 277-314.
Hauer, J., 1964. *Lecane remanei* n. sp., eines neues Rädertier aus dem Amazonas-Gebiet. Zool. Anz. 172: 27-30.
Hauer, J., 1965a. Über einige im Stromgebiet des Amazonas neu entdeckte Rädertiere. Beitr. naturk. Forsch. SW-Deutschl. 24: 41-46.
Hauer, J., 1965b. Zur Rotatorienfauna des Amazonasgebietes. Int. Revue ges. Hydrobiol. 50: 341-389.
Hempel, A., 1899. A list of the Protozoa and Rotifera found in the Illinois River and adjacent lakes at Havana, Ill. Bull. Illinois State lab. Nat. Hist., Urbana 5: 301-388.
Herrick, C. L., 1885. Notes on American rotifers. Bull. Sci. Lab. Denison Univ., Granville, Ohio 1: 43-62.
Hofsten, N., von., 1923. Rotatorien der Nordschwedischen Hochgebirge. Naturwiss. Untersuch. Sarekgeb. Schwed.-Lappland., Zool. 4: 829-894.
Hudson, C. T. & P. H. Gosse, 1886. The Rotifera or Wheel-Animalcules, both British and foreign. Quarto. London. Vol. 1: VI+128 pp., Vol. 2: 144pp.
Hutchinson, G. E., 1931. New and little-known Rotatoria from South Africa. Ann. Mag. N. Hist. (10)7: 561-568.
Idelson, M., 1924. [Eine neue Rädertierart der Gattung *Monostyla*]. Russ. Gidrobiol. Zhurnal 3: 224 (in Russian).
Idelson, M., 1925. [Über einige in der Umgegend der Biologischen Station zu Kossino gefundenen interessanten Rotatorien und Cladoceren-Formen]. Trudy Kossinskoj Biol. Stancii 2: 69-76 (in Russian).
ICZN, 1985. International Code of Zoological Nomenclature, 3rd edition, adopted by the XX. general assembly of the International Union of Biological Sciences. University of California Press, Berkeley and Los Angeres, 338pp.
Iroso, I., 1910. Primo contributo alla conoscenza dei Rotiferi del Lago-stagno craterico di Astroni. Monit. zool. Ital. 21: 299-304.
Jakubski, A. W., 1912. Beiträge zur Kenntnis der Süßwassermikrofauna Ostafrikas. I. Die Rädertiere der Usangusteppe. Zool. Anz. 39: 536-550.
Jakubski, A. W., 1914. Opis fauny wrotkow (Rotatoria) powiatu sokalskiego z uwzgl dnieniem qromad Brzuchorz skow (Gastrotricha) i Niesporczakow (Tardigrada). Rospr. wiad. mus. dzieduszyckich, Lwow, 1: 1-64.
Jennings, H. S., 1894. A list of the Rotatoria of the Great Lakes and of some of the inland lakes of Michigan. Bull. Michigan Fish Comm., Lansing, Michigan 3: 34pp.
Jennings, H. S., 1896. Report on the Rotatoria, with description of a new species. Bull. Michigan Fish Comm., Lansing, Michigan 6: 85-93.
Jennings, H. S., 1900. Rotatoria of the United States, with especial reference to those of the Great Lakes. Bull. U. S. Fish Comm., Washington 19: 67-104.
José de Paggi, S., 1989. Rofiteros de algunas provincias del Noroeste argentino. Rev. Hydrobiol. trop. 22: 223-238.
Kertész, G., 1955. Neuere Beiträge zur Systematiek und Verbreitung von *Lecane ichthyoura* (Anderson-Shephard), Rotatoria. Zool. anz. 154(9/10): 245-249.
Koch-Althaus, B., 1963. Systematische und ökologische Studien an Rotatorien des Strechlinsees. Limnologica (Berlin) 1: 375-456
Koniar, P., 1957. Zoocenóza machov vo vodopádoch a potockoch Vysokych Tatier. Acta fac. rer. natur. univ. Col., Zoologia 2: 87-109 (in Czech).
Korde, N. V., 1927. O neskolkich kolovratkach iz rodov *Lecane* i *Monostyla* novych dla Fauny Rossii. Ivzest. Ivanovo-Voznessenskogo Politchn. Inst. 10: 77-85 (in Russian).

Koste, W., 1962. Über die Rädertierfauna des Darnsees in Epe bei Bramsche, Kreis Bersenbrück. Veröff. Naturw. ver. Osnabrück 30: 73-137.
Koste, W., 1972. Rotatorien aus Gewässern Amazoniens. Amazoniana 3: 258-505.
Koste, W., 1974. Zur Kenntnis der Rotatorienfauna der "Schwimmenden Wiese", einer Uferlagune in der Varzea Amazoniens, Brasilien. Amazoniana 5: 25-60.
Koste, W., 1975. Über den Rotatorienbestand einer Mikrobiozönose in einem tropischen aquatischen Saumbiotop, der *Eichornia-crassipes*-Zone im Litoral des Bung-Borapet, eine Stausee in Zentralthailand. Gewässer Abwässer 57/58: 43-58.
Koste, W., 1978. Rotatoria. Die Rädertiere Mitteleuropas. Borntraeger, Berlin, 2 vols: 673 pp., 234 plates.
Koste, W., 1979. New Rotifera from the River Murray, South-eastern Australia, with a Review of the Australian Species of *Brachionus* and *Keratella*. Aust. J. Mar. Freshwater Res. 30: 237-253.
Koste, W., 1983. Das Rädertier-Porträt. *Lecane*, eine formen- und artenreiche Rädertiergattung. Mikrokosmos 6: 174-180.
Koste, W., 1986. Über die Rotatorienfauna in Gewässern südöstlich von Conceptión, Paraguay, Südamerika. Osnabrücker naturwiss. Mitt. 12: 129-155.
Koste, W., 1988a. Rotatorien aus Gewässern am Mittleren Sungai Mahakam, einem Überschwemmungsgebiet in E-Kalimantan, Indonesian Borneo. Osnabrücker naturwiss. Mitt. 14: 91-136.
Koste, W., 1988b. Über die Rotatorien einiger Stillgewässer in der Umgebung der Biologischen Station Panguana im tropischen Regenwald in Peru. Amazoniana 10: 303-325.
Koste, W., 1990. Zur Kenntnis der Rädertierfauna des Kinda-Stausee in Zentral-Birma (Aschelminthes: Rotatoria). Osnabrücker naturwiss. Mitt. 16: 83-109.
Koste, W. & K. Böttger, 1989. Rotatorien aus Gewässern Ecuadors. Amazoniana 10: 407-438.
Koste, W. & K. Böttger, 1992. Rotatorien aus Gewässern Ecuadors II. Amazoniana 12: 263-303.
Koste, W. & S. José de Paggi, 1982. Rotifera of the Superorder Monogononta recorded from Neotropis. Gewässer Abwässer 68/69: 71-102.
Koste, W., W. Janetzky & E. Vareschi, 1991. Über die Rotatorienfauna in Bromelien-Phytotelmata in Jamaika (Aschelminthes: Rotatoria). Osnabrücker naturwiss. Mitt. 17: 143-170.
Koste, W. & B. Robertson, 1983. Taxonomic studies on the Rotifera (Phylum Aschelminthes) from a Central Amazonian varzea lake, Lago Camaleão (Ilha de Marchantaria, Rio Solimões, Amazonas, Brasil). Amazoniana 8: 225-254.
Koste, W., B. Robertson & E. Hardy, 1984. Further taxonomical studies of the Rotifera from Lago Camaleão, a Central Amazonian varzea lake (Ilha de Marchantaria, Rio Solimões, Amazonas, Brasil). Amazoniana 8: 555-576.
Koste, W. & R. J. Shiel, 1980. New Rotifera from Australia. Trans. R. Soc. S. Aust. 104(5): 133-144.
Koste, W. & R. J. Shiel, 1989. Classical taxonomy and modern methodology. Hydrobiologia 186/187: 279-284.
Koste, W. & R. J. Shiel, 1990. Rotifera from Australian inland waters. V. *Lecanidae* (Rotifera: Monogononta). Trans. R. Soc. S. Aust. 114(1): 1-36.
Koste, W., R. J. Shiel & M. A. Brock, 1983. Rotifera from Western Australian wetlands with description of two new species. Hydrobiologia 104: 9-17.
Koste, W., R. J. Shiel & L. W. Tan, 1988. New rotifers (Rotatoria) from Tasmania. Trans. R. Soc. S. Aust. 112: 119-131.
Künne, C., 1926. Zur Rädertier-Fauna des Seeburger Sees. Zeitschr. Morph. Ökol. Tiere 6: 207-286.
Kutikova, L. A., 1970. Kolovratki Fauna SSSR. [The rotifer fauna of the USSR] Fauna SSSR 104, Academia Nauk, 744 pp (in Russian).
Kutikova, L. A. & I. V. Arov, 1985. Novie vidii psammofilinih kolovratok (Rotatoria) v ozere Baikal. [New psammophile rotifers from Lake Baikal] *in*: Kolovratki. Materialy vtorogo Vsesoyuznogo simpoziuma po kolovratkam. Nauka, St. Petersburg, 223 pp. (in Russian).
Leissling, R., 1914. Ein Beitrag zur Rotatorienfauna der Plöner Gewässer. Arch. hydrobiol. 9: 253-258.
Levander, K. M., 1894. Materialen zur Kenntniss der Wasserfauna in der Umgebung von Helsingfors, mit besonderer Berücksichtigung der Meeresfauna. II. Rotatorien. Acta Soc. Fauna et Flora Fennica, Helsingfors 12: 70pp.
Lieder, U., 1956. Introgressive Hybridisation als Evolutionsfaktor bei den Gattungen *Bosmina* und *Daphnia* (Crustacea, Cladocera). Die Naturwiss. 43: 207.
Lord, J. E., 1890. The genus *Distyla*, class Rotifera. Sci. Gossip 26: 201-202.
Lucks, R., 1912. Zur Rotatorienfauna Westpreussens. Octavo. Danzig VIII+207 pp.

Mamaril, A. C. & C. H. Fernando, 1978. Freshwater zooplankton of the Philippines (Rotifera, Cladocera, and Copepoda). Nat. & Appl. sci. bull. 30: 169-221.

Manfredi, P., 1929. Brevi appunti rotiferologici. Boll. pesca, Piscicolt. Idrobiol. 5: 3-8.

Martinez, C. C. & S. José de Paggi, 1988. Especias de *Lecane* Nitzch (Rotifera, Monogononta) en ambientes acuáticos del Chaco Oriental y del valle aluvial del río Paraná. Rev. Hydrobiol. trop. 21: 279-295.

Meissner, W., 1908. [Mikroskopische Wassertiere der Aralsee und der einmündenden Flüsse, im Zusammenhang met der Frage über deren Verbreitungsbedingungen]. Izv. Turkestanskago Otd. Imp. Russkago Geogr. Obshch., Tashkent, 4: 1-102 (in Russian).

Mola, P., 1913. Nuove specie di rotiferi loricati (Rattulidae - Cathypnidae - Coluridae). Zool. Anz., 42: 112-125.

Mola, P., 1930. Fauna Rotatoria italiana della acque dolci. Int. Revue ges. Hydrobiol. 23: 428-477.

Müller, O. F., 1776. Zoologiae Danicae prodomus, seu animalium Daniae et Norvegiae indigenarum characteres, nomina, et synonyma impremis popularium. 12mo. Havniae. XXXII+282 pp.

Müller, O. F., 1786. Animalcula Infusoria fluviatilia et marina, quae detexit, systematice descripsit et ad vivum delineari curavit...sistit opus hoc posthumum quod cum tabulis aeneis L. in lucem tradit vidua ejus nobilissima, cura Othonis Fabricii. Quarto. Havniae. LVI+367 pp.

Muraveisky, S. D., 1937 [Rotifera of Issbik-Kula]. Trudy Sredneaz. Gos. Univ., ser. 8a: 1-18 (in Russian).

Murray, J., 1906. The Rotifera of the Scottish lochs. Including descriptions of new species by C. F. Rousselet and David Bryce. Trans. Royal Soc. Edinburgh 45: 145-191.

Murray, J., 1913a. South American Rotifera. Part II. J. r. Micr. Soc.: 341-362

Murray, J., 1913b. Australasian Rotifera. J. r. Micr. Soc.: 455-461

Murray, J., 1913c. Notes on the Family *Cathypnidae*. J. r. Micr. Soc.: 545-564.

Myers, F. J., 1917. Rotatoria of Los Angeles, California, and vicinity, with descriptions of a new species. Proc. U. S. Nation. Museum 52: 473-478.

Myers, F. J., 1936a. Psammolittoral rotifers of Lenape and Union Lakes, New Jersey. Amer. Mus. Novitates 830: 22pp.

Myers, F. J., 1936b. Three new brackish water and one new marine species of Rotatoria. Trans. Amer. Micr. Soc. 55: 428-432

Myers, F. J., 1936c. Rotifers from the Laurentides National Park with descriptions of two new species. Canadian Field Natur. 50: 82-84.

Myers, F. J., 1937. Rotifera from the Adirondack region of New York. Amer. Mus. Novitates 903: 17pp.

Myers, F. J., 1938. New species of Rotifera from the collection of the American Museum of Natural History. Amer. Mus. Novitates 1011: 17pp.

Myers, F. J., 1941. *Lecane curvicornis* var. *miamiensis*, new variety of Rotatoria, with observations on the feeding habits of rotifers. Not. nat. Acad. Nat. Sci. Philadelphia 75: 1-8.

Myers, F. J., 1942. The rotatorian fauna of the Pocono Plateau and environs. Proc. Acad. Nat. Sci. Philadelphia 94: 251-285.

Naberezhniyi, A. I. & C. G. Irmasheva, 1975. [Lecanidae (Rotatoria) from Moldavian waters]. Biol. Res. Vod. Moldav 13: 57-75 (in Russian).

Nayar, C. K. G., 1968. Rotifer Fauna of Rajastan, India. Hydrobiologia 31: 168-185.

Neiswestnova-Shadina, K. S., 1935. Zur Kenntnis des rheophilen Mikrobenthos. Arch. Hydrobiol. 28: 555-582.

Nitzsch, C. L., 1827. *Cercaria*. Allg. Encycl. Wissensch. und Künste (Ersch und Gruber), Leipzig, 1-16: 66-69.

Nogrady, T., 1957. Beiträge zur limnologie und Rädertierfauna Ungarischer Natrongewässer. Hydrobiologia 9: 348-360.

Nogrady, T., 1962. On the Rotifera and limnology of a Hungarian bog pond. Can. J. Zool. 40: 677-684.

Nogrady, T., 1983. Some new and rare warmwater rotifers. Hydrobiologia 106: 107-114.

Nogrady, T., R. L. Wallace & T. W. Snell, 1993. Rotifera. Vol 1: Biology, Ecology and Systematics. Guides to the identification of the Microinvertebrates of the Continental Waters of the World 4. SPB Academic Publishing bv, The Hague, The Netherlands, 142 pp.

Novotná-Dvorakova, M., 1963. Rotatorien des flusses Yamuna (Indien). Acta soc. zool. Bohemoslov. 3: 170-177.

Olofsson, O., 1917. Süsswasser-Entomostraken und Rotatorien von der Murmanküste und aus dem nördlichsten Norwegen. Zool. Bidrag Uppsala 5: 259-294.

Olofsson, O., 1918. Studien über die Süsswasserfauna Spitsbergens. Zool. Bidrag Uppsala 6: 183-648.
Ovander, E. N., 1980a. [Rotifers of the genus *Lecane* (Rotatoria, Lecanidae) in the Ukrainian fauna]. Vest. Zool. 34-41 (in Russian).
Ovander, E. N., 1980b. [Use of indexes for the diagnosis of rotifer species from the genus *Lecane* (Rotatoria, Lecanidae)]. Vest. Zool. 42-46 (in Russian).
Pardo, L., 1931. Nueva adición a los Rotíferos de la Malvarosa (Valencia). Asociación Esp. Prog. Ciencias C. Lisboa 5: 67.
Pawłowski, L. K., 1938. Materialien zur Kenntnis der moosbewohnenden Rotatorien Polens. I. Annls Mus. Zool. Polon., Warszawa 13: 115-159.
Pax, F., & K. Wulfert, 1941. Die Rotatorien deutscher Schwefelquellen und Thermen. Arch. Hydrobiol. 38: 165-213.
Pejler, B., 1956. Introgression in planktonic Rotatoria with some points of view on its causes and conceivable results. Evolution 10: 246-261.
Pejler, B., 1962. On the taxonomy and ecology of benthic and periphytic Rotatoria. Zool. Bidr., Upps. 33: 327-421.
Pejler, B., 1977. General problems on rotifer taxonomy and global distribution. Arch. Hydrobiol. Beih. 8: 212-220.
Pejler, B. & B. Bērziņš, 1994. On the ecology of Lecane (Rotifera). Hydrobiologia 273: 77-80.
Pell, A., 1890. Three new rotifers. The microscope, Detroit, Michigan 10: 143-145.
Pennak, R. W., 1939. A new rotifer of the psammolittoral of some Wisconsin lakes. Trans. Amer. Microscop. Soc. 58: 222-223.
Piovanelli, S., 1903. I Rotiferi commensali della *Telphusa fluviatilis* Lmk. Mon. Zool. Italiano, Siena 14: 345-349.
Remane, A., 1932. Die Rotatorien, Gastrotrichen, Kinorhynchen und Archianneliden der Arktis. "Fauna Arctica", Jena 6: 95-114.
Retowski, L. O., 1933. Über das Plankton der Seen der Murmanküste. Trudy Arckti esk. Inst., St. Petersburg 3: 5-28 (in Russian, with German summary).
Riikoja, H., 1933. Contributions to the Rotifera Fauna of Estonia with description of a new species *Lecane matsaluensis*. Loodusuurijate Seltsi aruandest, Tartu 40: 3-7
Rodewald, L., 1937. Rädertierfauna Rumäniens. II. Neue und bemerkenswerte Rädertiere aus Rumänien. Zool. Anz. 118: 235-248.
Rodewald, L., 1940. Rädertierfauna Rumäniens. IV. Zool. Anz. 130: 272-289.
Rudescu, L., 1960. Rotatoria. Fauna Rep. Pop. Rom., Trochelminthes. II. Acad. R.P.R., 1192 pp.
Russell, C. R., 1953. Some Rotatoria of the Chatham Islands. Rec. Cant. Mus. 6: 237-244.
Russell, C. R., 1956. Some Rotifers from the Fiordland District. Rec. Cant. Mus. 7: 55-59.
Russell, C. R., 1958a. Rotifera. Reports of the B.A.N.Z. Antarctic Research Expedition, 8: 83-87.
Russell, C. R., 1958b. Additions to the Rotatoria of New Zealand. Part VIII. Trans. Roy. Soc. New Zealand 87: 69-73.
Sachse, R., 1915. Zur Rotatorienfauna Deutschlands. Arch. Hydrobiol. 10: 66-76
Sanoamuang, L. & V. M. Stout, 1993. New records of rotifers from the South Island lakes, New Zealand. Hydrobiologia 255/256: 481-490.
Sarma, S. S. S., 1988. New records of freshwater rotifers (Rotifera) from Indian waters. Hydrobiologia 160: 263-269.
Sarma, S. S. S. & G. P. S. Ghimire, 1990. Rotifers (Rotifera) of Kathmandu Valley, Nepal. Environment & Ecology 8: 1016-1021.
Schmarda, L. K., 1859. Neue wirbellose Thiere beobachtet und gesammelt auf einer Reise um die Erde 1853 bis 1857. Quarto. Wien. 1e Band, Turbellarien, Rotatorien und Anneliden. 1. Hälfte. XVIII+66 pp.
Segers, H., 1991a. Nomenclatorial note on a primary homonym in the genus *Lecane*. Rev. Hydrobiol. trop. 24: 77.
Segers, H., 1991b. Contribution to the knowledge of the rotifer fauna of the Galàpagos islands. Biol. Jb. Dodonaea 58 (1990): 113-119.
Segers, H., 1992. Taxonomy and Zoogeography of the rotifer fauna of Madagascar and the Comoros. J. Afr. Zool. 106: 351-361.
Segers, H., 1993. Rotifera of some lakes in the floodplain of the River Niger (Imo State, Nigeria). I. New species and other taxonomic considerations. Hydrobiologia 250: 39-61.
Segers, H., 1994. On four new tropical and subtropical *Lecane* (Lecanidae, Monogononta, Rotifera). Hydrobiologia, 287: 243-249.

Segers, H. & L. De Meester, 1994. The Rotifera of Papua New Guinea, with the description of a new *Scaridium* Ehrenberg, 1830. Arch. Hydrobiol. 131: 111-125.
Segers, H. & H. J. Dumont, 1993a. Zoogeography of Pacific Ocean islands: a comparison of the rotifer faunas of Easter Island and the Galápagos archipelago. Hydrobiologia 255/256: 475-480.
Segers, H. & H. J. Dumont, 1993b. Rotifera from Arabia, with descriptions of two new species. Fauna of Saudi Arabia 13: 3-26.
Segers, H., N. Emir & J. Mertens, 1992. Rotifera from north an northeast Anatolia (Turkey). Hydrobiologia 245:179-189.
Segers, H., C. S. Nwadiaro & H. J. Dumont, 1993a. Rotifera of some lakes in the floodplain of the River Niger (Imo State, Nigeria). II. Faunal composition and diversity. Hydrobiologia 250: 63-71.
Segers, H. & L. Sanoamuang, 1994. Two more new species of *Lecane* (Rotifera, Monogononta), from Thailand. Belg. J. Zool. 124: 39-46.
Segers, H., E. N. dos Santos Silva & A. L. de Oliveira-Neto, 1993b. New and rare species of *Lecane* and *Lepadella* (Rotifera: Lecanidae; Colurellidae) from Brazil. Belg. J. Zool., 123: 113-121.
Segers, H., S. S. S. Sarma, F. K. Kakkassery & C. K. G. Nayar, 1994. New records of Rotifera from India. Hydrobiologia 287: 251-258.
Selga, D., 1952. Contribución al conocimiento de los Rotíferos de España I. Rotíferos de las aguas continentales españolas y su distribución. P. Inst. Biol. Apl. 11: 113-123.
Sharma, B. K., 1978a. Contributions to the rotifer fauna of West Bengal. Part I. Family Lecanidae. Hydrobiologia 57: 143-153.
Sharma, B. K., 1978b. Two new Lecanid rotifers from India. Hydrobiologia 60: 191-192.
Sharma, B. K., 1979. Further contributions to the Lecanid fauna (Rotifera: Lecanidae) of West Bengal. Acta Hydrobiol. Krakov. 21: 53-59.
Sharma, B. K., 1980. A new lecanid rotifer from West Bengal, India. Bangladesh J. Zool. 8: 131-132.
Sharma, B. K., 1987. The distribution of the Lecanid rotifers (Rotifera: Monogononta: Lecanidae) in North-Eastern India. Rev. Hydrobiol. trop. 20: 101-105.
Shephard, J., 1892. Note on a new rotifer. Victorian natural., Melbourne 9: 15.
Shiel, R. J. & W. Koste, 1985. New species and new records of Rotifera (Aschelminthes) from Australian waters. Trans. r. Soc. S. Aust. 109: 1-15.
Skorikov, A. S. 1898. Ein neues Räderthier. Zool. Anz. 21: 556.
Snell, T. W., 1989. Systematics, reproductive isolation and species boundaries in monogonont rotifers. Hydrobiologia 186/187: 299-310.
Steinecke, F., 1917. Die Rotatorien und Gastrotrichen des Zehlaubruches. Schrift Phys.-Ökonom. Gesell. Königsberg 57 (1916): 84-100.
Steinecke, F., 1924. Die Rotatorienfauna von Ostpreussen. Schrift. Phys.-Ökonom. Gesell., Königsberg 64: 29-52.
Stenroos, K. E., 1898. Das Tierleben im Nurmijärvi-See. Eine faunistisch-biologische Studie. Acta Soc. Fauna et flora Fennica 17: 1-259.
Stewart, F. H., 1908. Rotifers and Gastrotricha from Tibet. Rec. ind. Mus., Calcutta 2: 316-323.
Stokes, A. C., 1896. Some new forms of American Rotifera. Ann. Mag. Nat. Hist., ser. 6, 18: 17-27.
Stokes, A. C., 1897. Some new forms of American Rotifera. II. Ann. Mag. Nat. Hist., ser. 6, 19: 628-633.
Sudzuki, M., 1964. New systematic approach to the Japanese planktonic Rotatoria. Hydrobiologia 23: 1-124.
Sudzuki, M., 1971. An analysis of colonisation in freshwater micro-organisms. I. Colonisation at 17 stations along the 5 lakes of the Mt. Fuji. Zool. Magazine 80: 191-201.
Sudzuki, M., 1989. The Rotifera from the Oriental Region and their characteristics. Special Issue celebrating the Centennial Anniversary of the Foundation of Nihon Daigaku-University, Tokyo. 3: 325-366
Sudzuki, M., 1991. The Rotifera from Singapore and Taiwan. Proc. Japan Soc. Syst. Zool. 43: 1-34.
Sudzuki, M., 1992. New Rotifera from Southwestern Islands of Japan. Proc. Japan Soc. Syst. Zool. 46: 17-28.
Sudzuki, M., Y. Hosoyama & Y. Deguchi, 1992. Occurrence of the Rotifera and Water Quality. Proc. Japan. Soc. Syst. Zool. 46: 71-99.
Tarnogradski, D. A., 1930. [The Rotiferfauna of the Northern Caukasus belonging to the genera *Lecane*, *Monostyla* and *Colurella*]. Raboty Sev.-Kaukazskoj Gidrobiol. Stancii 2: 111-144 (in Russian).
Tarnogradski, D. A., 1961a. [Microflora and microfauna of peats in the Caucasus. 5. Sphagnetums of Maharsky gonge (Karatscheavo - Circassian Republic]. Raboty Sev.-Kaukazskoj Gidrobiol. Stancii 22: 3-32 (in Russian).
Tarnogradski, D. A., 1961b. [Panzerrotatorien des Kaukasus] Raboty Sev.-Kaukazskoj Gidrobiol. Stancii 22: 33-65 (in Russian).

Thienemann, A., 1933. Die Tierwelt der Nepenthes-Kannen. Arch. Hydrobiol., suppl. 11: 1-53.
Thomasson, K., 1953. Studien über das südamerikanische Südwasserplankton. 2. Zur Kenntnis des südamerikanischen Zooplanktons. Ark. Zool., ser. 2, 6: 189-194.
Thomasson, K., 1959. Plankton of some lakes in an argentine National Park, with notes on terrestrial vegetation. Acta Phytogeogr. Suecica 42: 1-83.
Thomasson, K., 1971. Amazonian algae. Mém. Inst. r. Sci. Nat. Belg., sér. 2, 86: 53 pp.
Török, P., 1935. A budapesti vizvezetéki viz sz redékének faunája. MTA. Mat. Term. Tud. Ért. 53: 637-664.
Turner, C. H., 1892. Notes upon the Cladocera, Copepoda, Ostracoda and Rotifera of Cincinnati, with descriptions of new species. Bull. Sci. Lab. Denison Univ., Granville, Ohio 6: 58-74.
Turner, P. N., 1990. Some rotifers from coastal lakes of Brazil, with description of a new rotifer, *Lepadella (Xenolepadella) curvicaudata* n. sp. Hydrobiologia 208: 141-152.
Turner, P. N. & C. Da Silva, 1992. Littoral Rotifers from the State of Mato Grosso, Brazil. Studies on Neotropical Fauna and Environment 27: 227-241.
Van Oye, P., 1926. Rotateurs nouveaux du Congo Belge. Bull. Soc. Zool. France 51: 49-54.
Varga, L., 1938. [Vorlaufige untersuchungen über die mikroskopischen Tiere des Balaton-Psammons]. Magyar Biol. Kut. Int. Munkái 10: 101-138 (in Hungarian).
Varga, L., 1945. [Die Sommer Rotatorien de Kis-Balatons]. Magyar Biol. Kut. Int. Munkái 16: 36-103 (in Hungarian).
Voigt, M., 1902. Die Rotatorien und Gastrotrichen der Umgebung von Plön. (Vorlaufige Mitteilung und Diagnosen einiger Nova). Zool. Anz. 25: 673-681.
Voigt, M., 1957. Rotatoria. Die Rädertiere Mitteleuropas. Berlin, Nikolassee. 2 Teile: 508 pp., 115 plates.
Wang, J., 1961. [Fauna of freshwater Rotifera of China]. Science press of China, Beijing, 285p. + 27 plates. (in Chinese).
Weisig, S., 1928. [Contribution to the knowledge of the rotifer fauna of Northern Persia]. Izv. Azerb. Gos. Univ. 7: 221-231. (in Russian).
Wiszniewski, J., 1932a. Sur quelques rotifères, trouvés en Espagne. Ach. Hydrobiol. Ryb. 6: 41-64.
Wiszniewski, J., 1932b. Les rotifères des rives sablonneuses du lac Wigry. Ach. Hydrobiol. Ryb. 6: 86-100.
Wiszniewski, J., 1934a. Les mâles des Rotifères psammiques. Mem. acad. Polon. Sci. Lett., Ser. B, Krakov.: 143-165.
Wiszniewski, J., 1934b. Les rotifères psammiques. Annls. Mus. Zool. Polon. 10: 339-399.
Wiszniewski, J., 1935. Note sur le psammon du lac Ohrid. Verh. Int. ver. Limnol. 7: 238-244.
Wiszniewski, J., 1936. Notes sur le psammon. III. Deux tourbières aux environs de Varsovie. Ach. Hydrobiol. Ryb. 10: 173-187.
Wiszniewski, J., 1953. Fauni wrotkow Polski i rejovow przyleglych. Polskie Arch. Hydrobiol. 14: 317-490.
Wiszniewski, J., 1954. Matériaux relatifs à la nomenclature et à la bibliographie des Rotifères. Polski Arch. Hydr. 2/15: 7-249.
Wulfert, K., 1939. Beiträge zur Kenntnis der Rädertierfauna Deutschlands. IV. Die Rädertiere der Saale- Elster Niederung bei Merseburg in ökologisch-faunistischer Beziehung. Arch. Hydrobiol. 35: 563-624.
Wulfert, K., 1940. Rotatorien einiger ostdeutscher Torfmoore. Arch. Hydrobiol. 36: 552-587.
Wulfert, K., 1960. Die Rädertiere saurer Gewässer der Dübener Heide. I. Die Rotatorien des Zadlitzmoors und des Wildenhainer Bruchs. Arch. Hydrobiol. 56: 261-298.
Wulfert, K., 1965. Rädertiere aus einigen afrikanischen Gewässern. Limnologica 3: 347-366.
Wulfert, K., 1966. Rädertiere aus dem Stausee Ajwa und der Trinkwasser-Aufbereitung der Stadt Baroda (Indien). Limnologica 4: 53-95.
Yamamoto, K., 1951. On six new Rotatoria from japan. Ann. Zool. Japon. 24: 157-162.
Yamamoto, K., 1953. Rotatorian Fauna of Ozeghara, with Description of two new species. Ann. Zool. Japon. 26: 14-19.
Yamamoto, K., 1955. A new rotifer (Order Ploima) from Japan. Ann. Zool. Japon. 28: 33-34.
Yamamoto, K., 1960. Plankton Rotatoria in Japanese Inland waters. Hydrobioglogia 16: 364-411.
Živković, A., 1987. [Fauna Rotatoria in the Yugoslav part of the Danube river and its flood regions at Apatin with descriptions of three new species]. Proc. fauna Sr. Serbia 4: 1-110 (in Serbian).
Zoppi de Roa, E., W. Vasques, G. Colomine & M. J. Pardo, 1990. Composicion preliminar del zooplankton del Rio Churun (Auyantepuy, Venezuela). Memoria Soc. ciencias Nat. La Salle 49/50: 29-44.

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